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APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

FOR

REMOVAL ACTIVITIES

AT THE

TOLEDO TIE TREATMENT SITE

LOCATED AT

ARCO INDUSTRIAL PARK
TOLEDO, OHIO

FEBRUARY 1998
(Revised April 1998)

Prepared For:

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C.1.0 INTRODUCTION

C.1.1 General

Kerr-McGee Chemical, LLC (Kerr-McGee) was issued a Unilateral/Administrative Order (UAO) dated December 24, 1997, pursuant to Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Action (CERCLA) pertaining to the Toledo Tie Treatment Site located in Toledo, Ohio (Site). Preparation of this document is in accordance, to the maximum extent practicable, with the provisions of the UAO, Docket No. V-W-'98-C-444 which requires Kerr McGee to prepare work plans necessary to conduct a time-critical removal action. A more detailed description of the Site and the proposed work activities is included in Section 1.0 of the Work Plan (HAI Document No. PWM001D.002).

This Quality Assurance Project Plan (QAPP) has been prepared for personnel representing Kerr-McGee, the U.S. Environmental Protection Agency (EPA), and HAI field personnel conducting the investigation. The QAPP is intended to provide the quality assurance and quality control guidelines for the activities described in the Work Plan and the Field Sampling and Analysis Plan (FSAP) which is Appendix A of the Work Plan.

The analytical subcontractor for this project will be Lancaster Laboratories. All analyses will be performed at their Lancaster, Pennsylvania facility. Lancaster's QAPP has been included as Attachment A of this document. If an alternate laboratory is required, its QAPP will be submitted as an addendum to this plan.

C.1.2 Objective

The objective of this plan is to document the procedures that will be used to collect sufficient data of known quality for the time-critical Removal Action. This plan is intended to be used as supplemental guidance to the Work Plan and Field Sampling and Analysis Plan. The quality assurance measures for

the analytical program will be in accordance with the appropriate U.S. EPA methods, good laboratory practices, and the laboratory's quality assurance program (located in Attachment A).

Table C.1 provides the anticipated list of the parameters to be analyzed and the accompanying methods. Reporting limits for all parameters will be in accordance with the provisions of the analytical methods used and good laboratory practices. Reporting limits may vary between samples as they can be affected by sample matrix, dilutions, and other interferences. If additional analytical methods are required, this document will be revised accordingly by addendum.

C.2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

C.2.1 General

The organizational chart for the project is presented in Figure 1. The individual who is primarily responsible for Quality Assurance (QA) will be the Quality Assurance Officer (QAO), who reports directly to the Project Manager. The responsibilities of key individuals are outlined below.

C.2.2 Field Operations Personnel

C.2.2.1 Project Manager (PM)

The PM for this project will be Scott Lockhart, P.E. of HAI. Mr. Lockhart will be responsible for the overall development and management of the project and is the communication link between project personnel, and any applicable regulatory agencies. Duties and responsibilities of the PM will be to:

1. administrate and supervise all phases of the project;
2. ensure project objectives are met within financial and time constraints;
3. work with the QAO and field personnel to plan and conduct project operations, progress meetings, etc.; and
4. review progress reports and analytical reports prior to being issued.

C.2.2.2 Quality Assurance Officer (QAO)

The QAO for this project will be Kevin Wildman of HAI. Mr. Wildman will be responsible for the adherence to the QAPP. Duties and responsibilities of the QAO will be to:

1. establish QA/QC procedures required for the project;
2. evaluate data quality and maintain QC records;
3. provide a communication link between project personnel and the laboratory;

4. monitor the progress of the field sampling personnel and enforce provisions of this plan; and

5. stop work at any time that the QAPP is not being adhered to, or if the quality of the results are jeopardized by the work in progress; once work is stopped, only the PM can restart activities.

C.2.2.3 Field Operations Coordinator (FOC)

The FOC for this project will be Mr. Jeff Arp. Mr. Arp will be responsible for overseeing the day-to-day conduct of project activities. Duties and responsibilities of the FOC will be to:

1. ensure the sampling activities are conducted in a manner that follows the procedures outlined in this plan and the Work Plan;

2. coordinate the sampling activities with the PM, QAO, and field personnel;

3. oversee the use, maintenance and operation of sampling equipment; and

4. report daily activities, problems, etc. to QAO and PM.

C.2.3 Laboratory Personnel

The laboratory will have its own project organization with responsibilities similar to that of the field operations personnel.

C.2.3.1 Laboratory Director

The Laboratory Director will be primarily responsible for the overall operation of the laboratory including all samples analyzed and data reported. The Laboratory Director will also be responsible for initiating corrective action measures when analytical data do not meet the requirements of this plan or the laboratory's QAPP.

C.2.3.2 Laboratory Project Director

The Laboratory Project Director will be the primary communication link between the laboratory and HAI's QAO. The Laboratory Project Director will be responsible for relating any special needs of the field operations personnel to the laboratory. The Laboratory Project Director will also provide the final review of all data packages before reporting results.

C.2.3.3 Laboratory Quality Assurance Officer

The Laboratory QAO will be primarily responsible for implementing the laboratory's QAPP within the laboratory and monitoring compliance with the laboratory's QAPP. The Laboratory QAO's duties will also include: conducting audits, reviewing all QC sample recoveries, reporting problems to Laboratory Director for corrective action, and other laboratory-related activities.

C.3.0 QA OBJECTIVES FOR MEASUREMENT

C.3.1 General

Data quality objectives for measurement during this project will be addressed in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC parameters). The collection of data used in this project will require that the sampling and analysis be performed using standard methods, with properly operated and calibrated equipment, and conducted by trained personnel.

C.3.2 Precision

Precision is the determination of the reproducibility of measurements under a given set of conditions, or a quantitative measure of the variability of a group of measurements compared to their average value. Precision of analytical results will be based upon laboratory replicate analyses. Precision is reported as Relative Percent Difference (%RPD). Precision goals for the parameters to be analyzed will be in accordance with the provisions of the U.S.EPA methods used for analysis.

C.3.3 Accuracy

Accuracy is defined as the degree of agreement of a measurement or average of measurements with an accepted reference or true value. Sampling accuracy can be assessed by evaluating the results of field and trip blanks. Analytical accuracy is assessed by percent recovery of analytical spikes and reference standards. Accuracy goals for parameters to be analyzed will be in accordance with the provisions of the U.S.EPA methods used for analysis.

C.3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, and/or environmental condition. Representativeness is best achieved by insuring that sampling locations are properly selected and sufficient number of samples are collected.

Functional data are provisional on meeting the criteria for representativeness. The QA goal will be to have all samples and measurements representative of the media sampled; representative samples are contingent on proper selection of sampling techniques, location, and number of samples collected to represent the media. Also, the aliquots taken for analysis should be representative of the sample received.

C.3.5 Completeness

Completeness expresses the measure of confidence with which the data, resulting from a data collection activity, meets the specific objectives of the activity. It is the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal operating conditions. While efforts will be made to have all generated data be valid data (complete), some samples may be lost or broken in transit or at the laboratory. In addition, the results may not be acceptable based on laboratory QC requirements. It will be the goal of this project to have 95% of the data generated to be complete data.

C.3.6 Comparability

Comparability expresses the measure of confidence in which data sets can be considered equivalent with regard to the measurement of a specific parameter and/or groups of parameters. The ability to compare data sets is particularly critical when a set of data for a specific parameter is compared to historical data for determining trends. By using standard sampling techniques, analytical methodologies, and reporting units, the comparability of data will be ensured.

C.4.0 SAMPLING

C.4.1 General

The purpose of this section is to detail the general sampling procedures that will be used to collect the data required to complete this project. The sampling efforts shall be uniform and follow specific protocols to be considered relevant to the project. Additional information is included in the Work Plan.

C.4.2 General Sampling Procedures

C.4.2.1 Sample Containers and Preservatives

Sample containers will consist of I-Chem 200 series (or equivalent) glass or plastic bottles and will be provided and prepared by the laboratory prior to sampling efforts. The laboratory will also provide any required preservatives. Table C.2 lists the containers, preservatives, and holding times for parameters that will be analyzed during this project.

C.4.2.2 Sample Labeling

All sample containers will be labeled at the time of sampling. Each label will be completed with the required information and then secured to the container with transparent packing tape to prevent accidental loss or damage. Required information on the sample label includes: project number, sample identification number, date, time, analyses, and sampler's initials. Also, any preservatives or special handling instructions will be clearly displayed on the label.

C.4.2.3 Sample Identification Numbers

All samples collected will be issued a unique Sample Identification Number (SIN) to aid in tracking and record keeping. SINs will be assigned by the QAO, and given to the FOC prior to sampling efforts. SINs will consist of four parts separated by hyphens. The first part of a SIN will be HAI's project number which is "PWM001."

The second part of a SIN represents the type of sample collected. Valid sample types and codes for this project are listed in Table C.3.

The third part of a SIN indicates the frequency of sampling, which sample of a similar sample type is referenced, or the interval from which a soil boring sample was collected. Numbering of the above sample types shall be as follows:

1. The majority of investigative samples (e.g., sediment, surface soil, surface water, etc.) will use a three digit number to indicate that a new sample location is being referenced. Numbers will start at 001 and increase by one for every new sample of that sample type.

2. Monitoring wells will use a three digit number to indicate the number of times the well has been sampled (i.e., the first time a monitoring well is sampled, the number will be 001, and the second time the number will be 002). When collecting a duplicate sample, the sample frequency number will be the same as the original sample; however, an "A" will be added to identify this as a duplicate sample

3. Soil boring samples are numbered slightly different than described above. The second segment of a soil boring sample number will designate the soil boring number, while the third segment will indicate the depth interval from which the sample was obtained. The first sample collected from a boring will be designated SS1, and the second SS2, etc. The corresponding depths of each soil sample will be clearly identified on the Soil Boring Log.

4. Field blanks and trip blanks will use a six digit number to indicate the date that the sample was collected. Format of this numbering system will be month, date, and year. An example for a blank collected on May 1, 1998 would be 050198.

The fourth and final part of a SIN will be a four digit code to identify the person responsible for collecting the sample. This code will consist of the first letter of the office from which the sampler originates followed by the individuals employee number (i.e., D153 would be employee number 153 from the Dublin office).

Designated office codes are:

D - HAI Dublin, OH T - HAI Toledo, OH
M - HAI Mason, OH W - HAI Warrensville Heights, OH

The SIN system described above is very important in the tracking and record keeping of the large number of samples to be collected for this project. For this reason, the SIN system will not be deviated from without authorization of the QAO. Any questions regarding the SIN system will be directed towards the QAO.

C.4.2.4 Sampling Equipment Preparation and Decontamination

Sampling equipment to be reused will be thoroughly decontaminated between sampling locations and at the beginning and end of each day. To decontaminate the equipment it will be washed with a mild non-phosphatic soap and thoroughly rinsed with distilled water. HAI Standard Operating Procedure (SOP) No. F1000 (refer to Attachment A of the FSAP) provides a more detailed description of decontamination procedures. If complete cleaning of any piece of sampling equipment is not possible, then it will be discarded and replaced with a clean article.

C.4.2.5 Sample Storage and Transportation

Field samples will be placed in portable coolers on ice immediately following sample collection and remain on ice until being delivered to the laboratory. Ice will be double bagged to prevent leakage and possible water damage to samples, sample labels, and documentation. Any samples not placed on ice immediately upon collection will be discarded, and a new sample will be collected.

C.4.2.6 Field Notes

General field notes will be recorded in waterproof surveyors notebooks using indelible ink. In addition to the field notebooks, certain activities will require the completion of data sheets. A Soil Boring Log (see Attachment B) will be completed for each soil boring/monitoring well installed. A Groundwater Monitoring Well Sampling Data Sheet (see Attachment B) must be completed for each monitoring well sampled. When weather conditions prohibit the completion of data sheets in the field, data may be recorded in field notebooks and then transferred to data sheets at the end of the day.

Additionally, a Daily Field Report (Attachment B) will be completed at the end of the day summarizing the day's activities and observations. Copies of the documentation will be forwarded to HAI's Dublin,

Ohio office weekly. If copies of previous work are required, then arrangements will be made with the QAO.

Field notebooks, field data sheets, or daily field reports will not be obscured, destroyed, or discarded, even if it contains errors or is illegible. Corrections will be made by drawing a single line through the error and writing in the correct information. Corrections will be dated and initialed by the person making the correction.

C.4.2.7 Chain-of-Custody

The chain-of-custody is discussed in Section C.5.0 of this plan.

C.4.2.8 Field Sampling Equipment List

Table C.4 is a list of the general field sampling equipment that will be available on-site. The field analysis equipment will be calibrated in accordance with the manufacturer's recommendations and this plan.

C.4.2.9 Sampling Quality Control

Several sampling quality control measures will be necessary to assess the integrity of samples collected. These measures include the use of field blanks and trip blanks to locate possible sources of sample contamination.

The number of field blanks (e.g., equipment/rinseate blanks) analyzed for a class of compounds will be "equal to" ten percent of the total samples analyzed, for that class, with a minimum of one per day. Field blanks will be collected by running laboratory prepared deionized water through sample collection equipment and preserved according to Table 2. Field blanks will be analyzed for the same parameters as the field samples. It is the samplers responsibility to collect the appropriate number of field blanks for the day's sampling efforts.

One trip blank per shipping container (e.g., cooler) will be required. Trip blanks are only necessary for samples requiring volatile organic analyses. Trip blanks will be prepared in the laboratory, prior to sampling efforts, using laboratory-prepared deionized water and preserved using the same procedures as the samples. Trip blanks must accompany sample containers during sample collection and transportation. When sampling groundwater and surface water, a field duplicate sample will be collected. The minimum frequency of field duplicate sample collection is one per every ten investigative samples. It is required that a field duplicate be collected every day during groundwater sampling events. A new field duplicate will be required if the members of the sampling team change during the day.

C.4.3 Site-Specific Sampling Procedures

Site-specific sampling procedures are presented in the Field Sampling and Analysis Plan.

C.5.0 SAMPLE CUSTODY

C.5.1 General

The intention of chain-of-custody (COC) procedures is to document in a legally defensible manner the transfer of custody of each sample from collection through analysis. Additional information regarding COC procedures is presented in HAI SOP No. F3014 (refer to Attachment A of the FSAP).

C.5.2 Chain-of-Custody

The importance of COC cannot be overstated. This documentation records the history of the samples' custody from acquisition to ultimate disposal. Samples collected may be used as legal evidence. As such, the hand-to-hand custody from the point of collection to delivery at the laboratory must be clearly documented. The National Enforcement Investigations Center (NEIC) of the U.S. EPA defines custody as:

1. the sample is in your physical possession;
2. the sample is within view after being in your physical possession;
3. the sample was in your possession and then you locked or sealed it to prevent tampering; and/or
4. the sample is placed in a designated secure place with limited access to authorized personnel only.

A COC form (see Attachment B) must accompany every shipping container. Each COC form will be filled out in triplicate. Information required on the COC form includes:

1. client information;
2. project information;
3. samplers' names;
4. sample identification numbers;
5. date and time of collection;
6. type of sample (grab or composite);

7. matrix or matrices;
8. sample description;
9. number of containers;
10. requested analyses;
11. remarks (preservatives); and
12. signatures of anyone relinquishing or accepting custody.

Field samplers will be responsible for the care and custody of the samples collected until the samples are transferred or dispatched properly. After completing a sampling event, sample custody will be transferred to a designated person who will maintain custody of samples until they are dispatched to the laboratory.

If samples are to be delivered to laboratory via a courier, a COC will be signed over to the courier. The courier will keep COC forms until relinquishing custody to the laboratory. One copy of the COC form will be retained before there is a transfer of custody to the courier. Evidence tape or custody seals will be placed so that when the coolers are opened the seals will be broken. Transparent tape will be used to guarantee that the seals are not accidentally removed or destroyed.

If samples will be delivered to the laboratory via commercial carrier, then the COC forms will be placed in a watertight, *Ziploc* bag and taped to the inside lid of the sample cooler. Evidence tape or custody seals will be placed so that when the coolers are opened the seals will be broken, transparent tape will be used to guarantee that the seals are not accidentally removed or destroyed.

C.5.3 Laboratory Custody Procedures

Samples will be received in an area designated for sample receipt and storage. Upon receipt, each sample will be assigned a unique laboratory sample identification number. This number, along with the date received and general description, will be recorded in the laboratory's master log. HAI's QAO will be immediately notified if there are any problems with the samples received (e.g., discrepancies between

COC and samples submitted, breakage, improper preservation, etc.). Additional information regarding laboratory custody procedures is presented in Attachment A.

C.5.4 Laboratory Documentation

Workbooks, bench sheets, instrument logbooks, and instrument printouts are used to trace the history of samples through the analytical process and to document and relate important aspects of the work, including the associated quality controls. All logbooks, bench sheets, instrument logs, and instrument printouts are part of the permanent record of the laboratory. Laboratory notebooks will be periodically reviewed by the Laboratory Section Heads for accuracy, completeness, and compliance with the Laboratory Quality Assurance Program Plan. Completed workbooks and instrument logbooks will be submitted to the Laboratory Director for storage.

The laboratory's documentation procedures are presented in Attachment A. In general, good laboratory practices require that the following (or equivalent) procedures be used. Each page, or as required, each entry will be dated and initialed by the analyst when the record is made. Errors in entry will be crossed out in indelible ink with a single stroke. The use of white-out, obliterating, or writing directly over the erroneous entry will be prohibited. All corrections will be initialed by the individual making the correction.

C.6.0 CALIBRATION PROCEDURES AND FREQUENCY

C.6.1 General

This section details the calibration procedures and frequency for both the field and laboratory instrumentation that will be used during this project. Materials used for instrument calibration will be obtained through the U.S. EPA Pesticide and Industrial Chemicals Repository, or a suitable commercial source.

C.6.2 Field Equipment Calibration Procedures

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and instructions for each instrument to ensure that all maintenance requirements are being observed.

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. The calibration of field instruments will be in accordance with the manufacturer's specifications. Frequency of calibration will be dictated by field conditions, instrument response, and the manufacturer's specifications. At a minimum all instruments will be calibrated at the beginning of each day and after any extended breaks (e.g. lunch).

C.6.3 Laboratory Instrumentation Calibration Procedures

Calibration of laboratory equipment will be based on approved written procedures. Records of calibration, repairs, or replacement will be filed and maintained by the laboratory's QAO. These records will be filed at the location where the work is performed and will be subject to QA audits. For all instruments, the laboratory will maintain a factory-trained repair staff with in-house spare parts or will maintain service contracts with vendors.

The laboratory will operate in strict accordance with the requirements of the U.S.EPA methods used. Any proposed deviations from calibration procedures will be submitted by the laboratory for approval in the form of a SOP.

C.7.0 ANALYTICAL PROCEDURES

The analytical methods which will be employed in this project are summarized in Table C.5. All analytical procedures will be conducted in accordance with the specified U.S.EPA methods. In the event that additional procedures are deemed necessary, the appropriate modifications will be made to this QAPP by revision or addendum.

C.8.0 DATA REDUCTION, REVIEW, REPORTING AND VALIDATION

C.8.1 Data Reduction

Analytical results will be reduced to the concentration units using the equations specified in the analytical procedure. Appropriate blank corrections will be applied in all cases. Calculations will be checked by senior laboratory staff.

C.8.2 Data Review

Each laboratory section will provide extensive data review prior to reporting results. In general, there are three levels of data review.

The analyst will be responsible for primary review of data generated from sample analysis. If recoveries of all quality control samples are within the method specified tolerances then the data will be presented to data review groups for secondary review. If recoveries of any quality control samples exceed specified tolerances, affected samples will be re-analyzed.

Secondary review will be conducted by data review groups to determine if analytical results are acceptable. If recoveries of all quality control samples are within the method specified tolerances then the data will be presented to laboratory project managers for final review. If recoveries of quality control samples exceed the specified tolerances affected samples will be submitted for re-analysis.

Final review of analytical results will consist of the Laboratory Project Director's determination that all analytical results of a sample(s) are consistent. If so, the data will be presented in a final report. If discrepancies or deficiencies exist in the analytical results, corrective action will be taken. Audits of final reports by the Laboratory Quality Assurance Officer may be conducted to determine the precision, accuracy, completeness, and representativeness of sample analyses.

C.8.3 Data Reporting

Data reporting will be in accordance with the appropriate U.S.EPA method used for analysis. Laboratory reports shall, at a minimum, include the following:

1. narrative including statement of samples received, description and rationale for any deviations from approved methods/SOPs, summary of data quality, and documentation of any significant problems encountered during analysis;
2. documentation of laboratory events including dates of sample receipt, sample extraction, and sample analysis;
3. analytical data including results, detection limits, dilutions, etc.;
4. a summary of QA/QC results and supporting documentation;
5. a copy of the signed COC for samples submitted for analysis.

Laboratory reports should be signed by the laboratory's QAO and/or the laboratory director prior to being issued. Reports will be issued to HAI's QAO. Any draft reports should be clearly identified as such.

C.8.4 Data Validation

Analytical data will be reviewed according to the laboratory's data validation procedures outlined in Attachment A. After passing internal data validation, the data will be reported to HAI's QAO. Data will be reviewed by HAI's QAO to determine that proper preservation, holding times, and sample analysis procedures have been followed and are clearly documented. Additionally, the analytical results will be reviewed and compared to previous data, if any. Any questions regarding the data reports will be brought to the laboratory project manager's attention.

If additional data validation is required by the U.S.EPA or appropriate state agencies, the data will be submitted for validation to an independent third-party data validator or the U.S. EPA. The analytical laboratory is required to address any comments and correct any deficiencies identified in the data validation report.

C.9.0 INTERNAL QUALITY CONTROL

C.9.1 General

The purpose of internal quality control measures is to document the validity of analytical data generated by the laboratory. Laboratory internal quality control may include, but is not limited to, the analysis of method blanks, reference standards, analytical spikes, and surrogate spikes. Every analytical series will include some of these controls depending on the analytical methods used. The internal quality controls used by the laboratory will be combined so they are completely representative of the analytical task from sample preparation and sample analysis.

The following sections present a summary of, and suggested frequencies for, various quality control measures that may be used dependent upon the analytical method(s) selected. The laboratory's QAPP, located in Attachment A, presents the actual quality control measures and frequencies that will be employed by the laboratory.

C.9.2 Blank Samples

Blanks are used to assess contamination introduced in transit, storage, or in the laboratory. The types and frequencies of laboratory blank samples are specified by the U.S.EPA methods used for analysis.

C.9.2.1 Method Blanks

Method blanks identify sources of contamination throughout the analytical process, whether a contribution of specific analytes or a source of interference, which will need to be identified, isolated, and corrected. To accomplish this, the method blank must be initiated at the beginning of the analytical process and include all aspects of the analytical work. This includes all glassware, reagents, and instrumentation, as well as any other possible source of contamination. Minimum method blank analyses will be one method blank per analytical series at a frequency of one per 20 samples.

C.9.2.2 Container Blank

The same concept for the method blank will apply to the sample bottles furnished from the laboratory. This container blank will be analyzed for each type of sample container as it would be used for collection. The frequency of analysis will extend to each lot of processed sample containers. At a minimum, the analysis of a container blank should be performed whenever the preparation process, preservation reagent, or the type of container changes.

C.9.2.3 Holding Blanks

Another type of method blank is a holding blank. Holding blanks are associated with volatile organic analyses and indicate possible cross-contamination among samples while stored at the laboratory. At least one holding blank, per each group of samples, will be generated and analyzed with the samples.

C.9.3 Reference Standards

Reference standards are standards of known concentration and independent in origin from the calibration standards. These reference standards are generally available through the U.S.EPA, the National Bureau of Standards, or are specified by analytical methodologies. The purpose of a reference standard is to assess analytical proficiency within an analytical series including the preparation of calibration standards, the validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards will be used in every analytical series except GC/MS and specific GC analyses, for which there are no reference standards.

A control chart will be maintained for analytes in which reference standards are used in their analyses. When a reference standard value exceeds the established warning limits, careful scrutiny will be given to the operations system, standards preparation, and procedures that were used in obtaining the result. If the value of the reference standard exceeds the established control limits, then the sample analysis will be stopped and corrective action will be initiated. Samples analyzed since the last passing reference standard will be re-analyzed following instrument recalibration.

C.9.4 Analytical Spikes

The purpose of an analytical spike is to assess the efficiency and proficiency of an analytical series. This includes quantitation standards, sample preparation, instrument set-up, and the premises inherent in quantitation. This control reflects the competency of sample analysis within an analytical series while it is less sensitive in reflecting the conditions which are within the control of the analyst. The types and frequencies of analytical spikes are specified by the U.S.EPA methods used for analysis.

C.9.4.1 Matrix Spike

Within an analytical series, a representative sample portion is designated as a separate sample and spiked with known concentrations of the analytes under consideration. Advantages of spikes are that the spiked portion is handled and prepared in exactly the same way as the samples. Sample related interference affecting analysis will be reflected in the results from the spiked sample. Results of spikes exceeding tolerances specified by the methods need to be evaluated thoroughly in conjunction with other measures of control.

C.9.4.2 Surrogate Spike

Surrogates, which have properties similar to the analytes of interest, are compounds unlikely to be found in nature. The intent of a surrogate spike is to provide broader insight to the proficiency and efficiency of an analytical method on a sample specific basis. This control reflects analytical conditions which may not be attributable to the sample matrix. If results of a surrogate spike analysis exceed method specified tolerances, then the analytical results need to be evaluated thoroughly in conjunction with other control measures. Re-analysis of the sample with additional controls, or different analytical methodologies, will be necessary.

C.9.5 Replicate Analysis

Replicate analysis is a measure of analytical precision and can be limited in its scope. If used in conjunction with reference standards or analytical spikes, it can measure the reliability of the analytical systems. Replicate analyses can be significant in the interpretation of analytical results for samples with complex matrices.

C.9.6 Calibration Check Standards

The purpose of a calibration check standard is to assess an instrument's stability. A calibration check standard will be analyzed at the beginning and end of an analytical series or periodically throughout large series of samples. Calibration check standard will be run after every ten samples. In analyses where internal standards are used, a calibration check standard need only be run at the beginning of an analytical series. If results of the calibration check standard exceed method specified tolerances, then samples analyzed since the last acceptable calibration check standard will be re-analyzed.

C.9.7 Internal Standards

Internal standards will be monitored when required by the method (e.g., U.S.EPA Method 624). The internal standard is present in all acquisitions with the exception of performance standards. The response of each compound within the internal standard is plotted on a control chart. The area of any compound cannot fall below 50% of its value in the preceding check standard, nor can it rise above 100% of its value. If internal standard areas in one or more samples exceed the specified tolerances, then the instrument will be recalibrated and all affected samples re-analyzed.

C.10.0 PERFORMANCE AND SYSTEM AUDITS

C.10.1 General

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed within the constraints of this plan. These audits can either be conducted internally by field or laboratory staff or externally by state or federal agencies. The laboratory will participate in any performance or system audit conducted or requested by HAI, appropriate state agencies, or the U.S.EPA.

C.10.2 Performance Audits

Performance audits will be conducted periodically to determine the accuracy of the total measurement system(s) or components. In this program, blind performance evaluation samples, submitted by state and federal agencies, are analyzed and evaluated throughout the year as part of an ongoing participation in their certification programs. Any deficiencies in the results of these analyses are reported to the laboratory and corrective action is initiated.

In addition to blind sample analyses, the laboratory will also participate in any audits from state and federal agencies. These agencies submit a report noting any deficiencies and necessary corrective action. The laboratory will respond with evidence of compliance within a limited time.

The laboratory also maintains a schedule of internal audits whereby each section of the laboratory is audited by the Laboratory Quality Assurance Officer. When the audit is completed, a formal report will be issued to the Laboratory Director. This report shall note any deficiencies and a follow-up date to confirm corrective action.

C.10.3 System Audits

A system audit is an evaluation of the various components of the measurement system to asses their proper selection and use. This includes a careful evaluation of all laboratory quality control measures. System audits will be conducted internally by the laboratory.

C.10.4 Field Audits

Internal audits of field activities (sampling and measurements) will be conducted by HAI's QAO and/or FOC. These audits will include examination of field sampling records, field instrument operating records, sample collection, shipping and handling, COC, etc. These audits will occur at the onset of the project to verify that the established procedures are followed. Follow-up audits will be conducted to correct deficiencies, and to verify the QA/QC procedures are being maintained throughout the project. When an audit is completed a written report will be submitted to the PM.

HAI personnel will participate in any external audit requested by state and federal agencies. The results and recommendations or any external audit should be reported to HAI's QAO and/or PM in a timely manner so that corrective actions may be initiated.

C.11.0 PREVENTIVE MAINTENANCE

Field instruments and equipment will be maintained and serviced according to the manufacturer's instruction manual. A maintenance record for each instrument will be maintained. These records will include dates and descriptions of service and preventive maintenance. Major maintenance on any environmental instruments will only be performed by the manufacturer or trained technicians. Field personnel will be responsible for daily maintenance of all equipment in their possession. Critical spare parts (e.g., batteries/chargers, probes, screws, etc.) and tools will be kept with the equipment. Equipment problems will be reported to the QAO or the PM immediately.

Laboratory instruments will be maintained and serviced according to the individual instrument manuals. The laboratory's preventative maintenance procedures are documented in Attachment A.

C.12.0 DATA PRECISION, ACCURACY, AND COMPLETENESS

C.12.1 Precision

Precision is a measure of agreement between repetitive measurements under identical conditions. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is much easier to control and quantify than sampling precision. Sampling precision may be determined by analyzing duplicates or replicate field samples and then creating and analyzing laboratory replicates from one or more of the field samples. The analytical results from the field duplicates or replicates provide data on overall measurement precision. Analytical results from the laboratory replicates provide data on analytical precision. Sampling precision can be calculated by subtracting the analytical precision from the overall measurement precision. For organic analyses, precision is reported as the Relative Percent Difference (%RPD) between matrix spike and matrix spike duplicate analysis. For metal analyses, precision is reported as %RPD between two duplicate samples. Acceptable limits for precision are specified by the U.S.EPA method. In the presence of outliers, corrective action will be taken including repairing instruments and/or re-analysis of the affected sample or samples. The following equation will be used in calculating %RPD:

$$\%RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

RPD = Relative Percent Difference

D1 = First Sample Value

D2 = Second Sample Value (duplicate)

C.12.2 Accuracy

Accuracy is the difference between a measured value and the actual value, or the bias in a measurement system. Accuracy is difficult to measure for the entire data collection activity. Sources of error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. Sampling accuracy can be assessed by evaluating the results of field and trip blanks.

For the analytical procedures to be used, accuracy is assessed by Matrix Spike Percent Recovery. Acceptable limits for accuracy are specified by the U.S.EPA method. In the presence of outliers, corrective action will be taken including fixing instruments and/or re-analysis of the affected sample or samples. Matrix spike percent recovery will be calculated by the following equation:

$$MSPR = \frac{SSR-SR}{SA} \times 100$$

MSPR = Matrix Spike Percent Recovery
SSR = Spike Sample Results
SR = Sample Results
SA = Spike Added (concentration)

C.12.3 Completeness

Completeness will be reported as the percentage of the measurements judged to be valid. Completeness goals for this project are presented in Section C.3.5. Completeness will be calculated by the following equation:

Completeness = 100 x (valid measurements / total measurements)

C.13.0 CORRECTIVE ACTION

C.13.1 General

Corrective actions may be required for either analytical and equipment problems or noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory analysis, and data review. Noncompliance problems are associated with nonconformance to this plan or the U.S.EPA methods being used.

C.13.2 Laboratory Corrective Action

When deficiencies or "out-of-control" situations exist, the laboratory will provide a means of detecting and correcting these situations. An "out-of-control" situation is defined as data exceeding control limits. Samples analyzed during "out-of-control" situations will be re-analyzed prior to reporting results. The laboratory's corrective action procedures are documented in Attachment A. In general, there are several levels of "out-of-control" situations that may occur in the laboratory during analysis.

C.13.2.1 Bench Level

Corrective action procedures will often be handled at the bench level. If an analyst finds a non-linear response during calibration of an instrument, then the instrument will be recalibrated before sample analysis. The problem may be corrected by a careful examination of the preparation or extraction procedure, spike and calibration mixes, or instrument sensitivity. If the problem persists, it will be brought to the management level.

C.13.2.2 Management Level

If resolution at the bench level was not achieved, or a deficiency is detected after the data has left the bench level, then corrective action becomes the responsibility of the Laboratory Manager or Director. Unacceptable matrix or surrogate spike recoveries detected by data review will be reported to the Laboratory Manager. A decision to re-analyze the sample or report results will be made depending on the circumstance.

C.13.2.3 Receiving Level

If discrepancies exist in either the documentation of a sample or its container, a decision will be made after consulting with the appropriate management personnel. Decisions will be fully documented. Some examples of container discrepancies are broken samples, inappropriate containers, or improper preservation. In these cases, corrective action will involve the Laboratory Project Manager contacting HAI's QAO.

C.13.3 Field Corrective Action

Corrective actions for field equipment problems will consist of reporting the problem to the PM and/or the QAO so that maintenance can be performed or new equipment can be acquired. Noncompliance problems will be reported immediately to the QAO. The QAO will consult with the PC and corrective actions will be initiated. When warranted, the PM will report the nature of the noncompliance and corrective actions implemented to the appropriate state agencies and/or the U.S. EPA. The nature, extent, and corrective action for all noncompliances will be documented.

C.14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

C.14.1 Internal Reporting

The Laboratory Quality Assurance Officer will report the status of the laboratory QA/QC program to the laboratory management. Each report will include:

1. periodic assessment of measurement data accuracy, precision, and completeness;
2. results of audits;
3. significant QA/QC problems and recommended solutions; and
4. resolutions of previously stated problems.

The laboratory will determine the content and frequency of these reports in accordance with its QAPP, which is included as Attachment A, and its SOPs. The laboratory will report to HAI's QAO when the results of HAI's samples have been affected by internal quality issues.

C.14.2 Additional Reporting

Laboratory analytical reports will include a summary of the quality assurance activities and quality control data for the project as related to sample analysis. The Laboratory Project Manager will report suspected field QA/QC problems to HAI's QAO.

HAI's QAO will report to HAI's PM when appropriate. These reports may be either oral or written depending upon the nature and complexity of the issues in the report.

C.15.0 REFERENCES

A variety of technical manuals, administrative documents, and publications were referred to in preparing this document. Some of the references consulted are presented below. Referenced documents and publications may or may not have been reviewed in their entirety. The guidelines and procedures presented in the documents and publications referenced have not been strictly adhered to unless stated otherwise.

U.S.EPA. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. EPA/600/4-83-004. February 1983.

U.S.EPA. Data Quality Objectives for Remedial Response Activities: Development Process. EPA/540/6-87/003. March 1987.

U.S.EPA. Data Quality Objectives for Remedial Response Activities: Example Scenario. EPA/540/6-87/004. March 1987.

U.S.EPA. A Compendium of Superfund Field Operations Methods. EPA/540/P-87/001. December 1987.

U.S.EPA. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, 3rd Edition. September 1986.

U.S.EPA. Methods for Chemical Analysis of Water and Wastes. EPA/600/4-79-020. March 1983.

U.S.EPA. Quality Assurance/ Quality Control Guidance for Removal Activities. EPA/540/G-90/004. April 1990.

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
8260 (VOCs)	1,1-Dichloroethene
	Chloromethane
	Bromomethane
	Vinyl Chloride
	Chloroethane
	Acrolein
	Acrylonitrile
	Methylene Chloride
	Trichlorofluoromethane
	1,1-Dichloroethane
	Chloroform
	1,2-Dichloroethane
	1,1,1-Trichloroethane
	Dichlorodifluoromethane
	Methyl Iodide
	Acetonitrile
	Acetone
	Carbon Disulfide
	Propionitrile
	Allyl Chloride
	Methacrylonitrile
	2-Butanone
	Dibromomethane
	1,4-Dioxane
	trans-1,2-Dichloroethene
	cis-1,2-Dichloroethene
	Trichloroethene
	Benzene
	Toluene
	Chlorobenzene
	Xylene (total)
	Carbon Tetrachloride
	Bromodichloromethane
	1,1,2,2-Tetrachloroethane

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
8260 (VOCs) cont.	1,2-Dichloropropane
	trans-1,3-Dichloropropene
	Dibromochloromethane
	1,1,2-Trichloroethane
	cis-1,3-Dichloropropene
	Bromoform
	Tetrachloroethene
	Ethylbenzene
	Isobutyl Alcohol
	Vinyl Acetate
	2-Chloro-1,3-butadiene
	1,2-Dibromoethane
	Methyl Methacrylate
	1,1,1,2-Tetrachloroethane
	tans-1,4-Dichloro-2butene
	1,2,3-Trichloropropane
	2-Hexanone
	4-Methyl-2-pentanone
	Ethyl Methacrylate
	Pentachloroethane
	1,2-Dibromo-3 chloropropane
	Styrene
8270 (SVOCs)	aniline
	acetophenone
	bis(2chloroisopropyl)ether
	ethyl methanesulfonate
	methyl methanesulfonate
	N-nitrosodiethylamine
	N-nitrosomethylethylamine
	N-nitrosomorpholine
	N-nitrosopiperidine
	N-nitrosopyrolidine
	2-picoline

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
8270 (SVOCs) cont.	o-toludine
	benzyl alcohol
	bis (2-chloroethoxy) methane
	bis (2-chloroethyl) ether
	2-chlorophenol
	2-methylphenol
	3- or 4-methylphenol
	1,2-dichlorobenzene
	1,3-dichlorobenzene
	1,4-dichlorobenzene
	hexachloroethane
	isophorone
	nitrobenzene
	2-nitrophenol
	N-nitrosodimethylamine
	N-nitrosodi-n-propylamine
	phenol
	pyridine
	2,6-dichlorophenol
	1,3-dinitrobenzene
	hexachloropropene
	isosafrole
	1,4-naphthoquinone
	N-nitrosodi-n-butylamine
	1,4-phenylenediamine
	safrole
	1,2,4,5-tetrachlorobenzene
	O,O,O-triethylphosphorothioate
	a,a-dimethylphenethylamine
	4-chloroaniline
	4-chloro-3-methylphenol
	2-chloronaphthalene
	2,4-dichlorophenol
	2,4-dimethylphenol
	dimethyl phthalate

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
8270 (SVOCs) cont.	2,6-dinitrotoluene
	hexachlorobutadiene
	hexachlorocyclopentadiene
	2-methylnaphthalene
	naphthalene
	2-nitroaniline
	1,2,4-trichlorobenzene
	2,4,5-trichlorophenol
	2,4,6-trichlorophenol
	2,3,4,6-Tetrachlorophenol
	dimethoate
	1-naphthylamine
	2-naphthylamine
	5-nitro-o-toluidine
	pentachlorobenzene
	phenacetin
	tetraethyldithiopyrophosphate
	1,3,5-trinitrobenzene
	diallate (trans/cis)
	acenaphthene
	acenaphthylene
	4-bromophenyl phenyl ether)
	4-chlorophenyl phenyl ether
	dibenzofuran
	diethyl phthalate
	4,6-dinitro-2-methylphenol
	2,4-dinitrophenol
	2,4-dinitrotoluene
	fluorene
	hexachlorobenzene
	3-nitroaniline
	4-nitroaniline
	4-nitrophenol
	N-nitrosodiphenylamine
	2-acetylaminofluorene

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
8270 (SVOCs) cont.	4-aminobiphenyl
	chlorobenzilate
	p-(dimethylamino)azobenzene
	7,12-dimethylbenz(a)anthracene
	3,3'-dimethylbenzidine
	isodrin
	3-methylcholanthrene
	4-nitroquinoline-1-oxide
	pentachloronitrobenzene
	pronamide
	methapyrilene
	thionazin
	anthracene
	benzo (a) anthracene
	benzo (b) fluoranthene
	benzo (k) fluoranthene
	benzo (ghi) perylene
	benzo (a) pyrene
	bis (2-ethylhexyl) phthalate
	butyl benzyl phthalate
	chrysene
	di-n-butyl phthalate
	dibenz (a,h) anthracene
	3,3'-dichlorobenzidine
	di-n-octyl phthalate
	fluoranthene
	indeno (1,2,3-cd) pyrene
	pentachlorophenol
	phenanthrene
	pyrene
8081(Organochlorine Pesticides)	Kepone
	Heptachlor
	Aldrin
	Dieldrin

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
8081 (Organochlorine Pesticides) cont.	Endrin
	DDT
	Alpha BHC
	Chlordane
	Beta BHC
	Gamma BHC - Lindane
	Delta BHC
	Heptachlor Epoxide
	DDE
	DDD
	Methoxychlor
	Toxaphene
	Endosulfan I
	Endosulfan II
	Endosulfan Sulfate
	Endrin Aldehyde
	PCB-1016
	PCB-1221
	PCB-1232
	PCB-1242
	PCB-1248
	PCB-1254
	PCB-1260
8141 (Organochlorine Pesticides)	Ethyl Parathion
	Famphur
	Phorate
	Disulfoton
	Methyl Parathion
8252 (Chlorinated Herbicides)	2,4-D
	2,4,5-TP
	2,4,5-T
	Dinoseb
	Hexachlorophene

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.1

Parameter List

U.S. EPA Method	Parameters
7470 (Inorganics/Metals)	Arsenic
	Barium
	Cadmium
	Chromium
	Copper
	Lead
	Mercury
	Selenium
	Silver
	Zinc

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.2

Sample Containers and Preservation

Parameter	Containers	Preservatives/ Max Holding Time
SVOCs (8270)	Soils - one 8oz. wide mouth jar.	Cool 4°C / 10 (40) days[1]
	Aqueous - three 1 liter bottles.	Cool 4°C / 5 (40) days[1]
Pesticides (8081)	Soils - one 8oz. wide mouth jar.	Cool 4°C / 10 (40) days[1]
	Aqueous - three 1 liter bottles.	Cool 4°C / 5 (40) days[1]
Metals (6000/7000)	Soils - one 8 oz. wide mouth jar	Cool 4°C
	Aqueous - 250 ml plastic	HNO_3 pH > 2
TCLP (1311)	Soils - two 8 oz. wide mouth jar	Cool 4°C
	Aqueous - three 1 liter bottles.	Cool 4°C
Reactive sulfide	Soils - one 4 oz. wide mouth jar	Cool 4°C
	Aqueous - 250 ml plastic	Cool 4°C
Reactive cyanide	Soils - one 4 oz. wide mouth jar	Cool 4°C
	Aqueous - 250 ml plastic	Cool 4°C
pH (150.1)	Soils - one 2 oz. wide mouth jar	Cool 4°C
	Aqueous - 250 ml plastic	Cool 4°C
Flash point (1010)	Soils - one 2 oz. wide mouth jar	Cool 4°C
	Aqueous - 250 ml plastic	Cool 4°C

Note: All holding times are from time of sample collection. This list represents typical sample containers that may be supplied for this project. The contracted laboratory will provide a detailed sheet describing the types and number of containers sent for each analysis with each sample kit. The actual number of containers may be less as several parameters may be combined into a single container. The laboratory will also provide any required preservatives and instructions for preservation. If pre-preserved bottles are supplied, they will be clearly identified on the sampling container.

[1] 5 or 10 days pre-extraction / 40 days post extraction.

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.3

Sample Types and Codes

Type	Code
Water	
Monitoring Well	MW(designated monitoring well I.D.)
Surface Water	SW(designated monitoring station))
Sediment	SED
Soil	
Surface Soil	SS(designated sampling location I.D.)
Soil Boring	SB(designated boring I.D.)
Drum Sample	DS
QA/QC	
Duplicate	Same as well code
Field Blank	FB(number)[1]
Trip Blank	TB(number)[1]

[1] Numbers for field and trip blanks begin at 1 and increase by increments of 1 every time a new blank is collected. The number will begin at 1 at the beginning of every day.

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.4

Field Equipment List

1 Visqueen
2. non-phosphatic soap
3. Distilled water
4. Trash bags
5. Analytical containers
6. Shipping containers/coolers
7. Ice
8. Indelible ink pens
9. Clear packing tape
10. Health and safety equipment
11. Decon supplies
12. Tools

Note: This represents a general list of sampling equipment required for this project. Additional equipment required for specific tasks is presented in the FSAP.

Quality Assurance Project Plan
Toledo Tie Treatment Site

Table C.5

Analytical Procedures

U.S. EPA Methods	Parameters
1311 - 8240	TCLP volatiles
1311 - 8270	TCLP semi-volatiles
1311 - 8080 & 8150	TCLP pesticides/herbicides
1311 - 6000/7000 series	TCLP metals
1010	flash point
150.1	pH
SW-846 Section 7.3.3.2	reactive cyanide
SW-846 Section 7.3.4.1	reactive sulfide
6000/7000 series	metals
8260	volatile organics
8270	semi volatile organics
8081	organochlorine pesticides/PCBs
8141	organophosphorous pesticides
8252	chlorinated herbicides
9012	cyanide
9030	sulfide

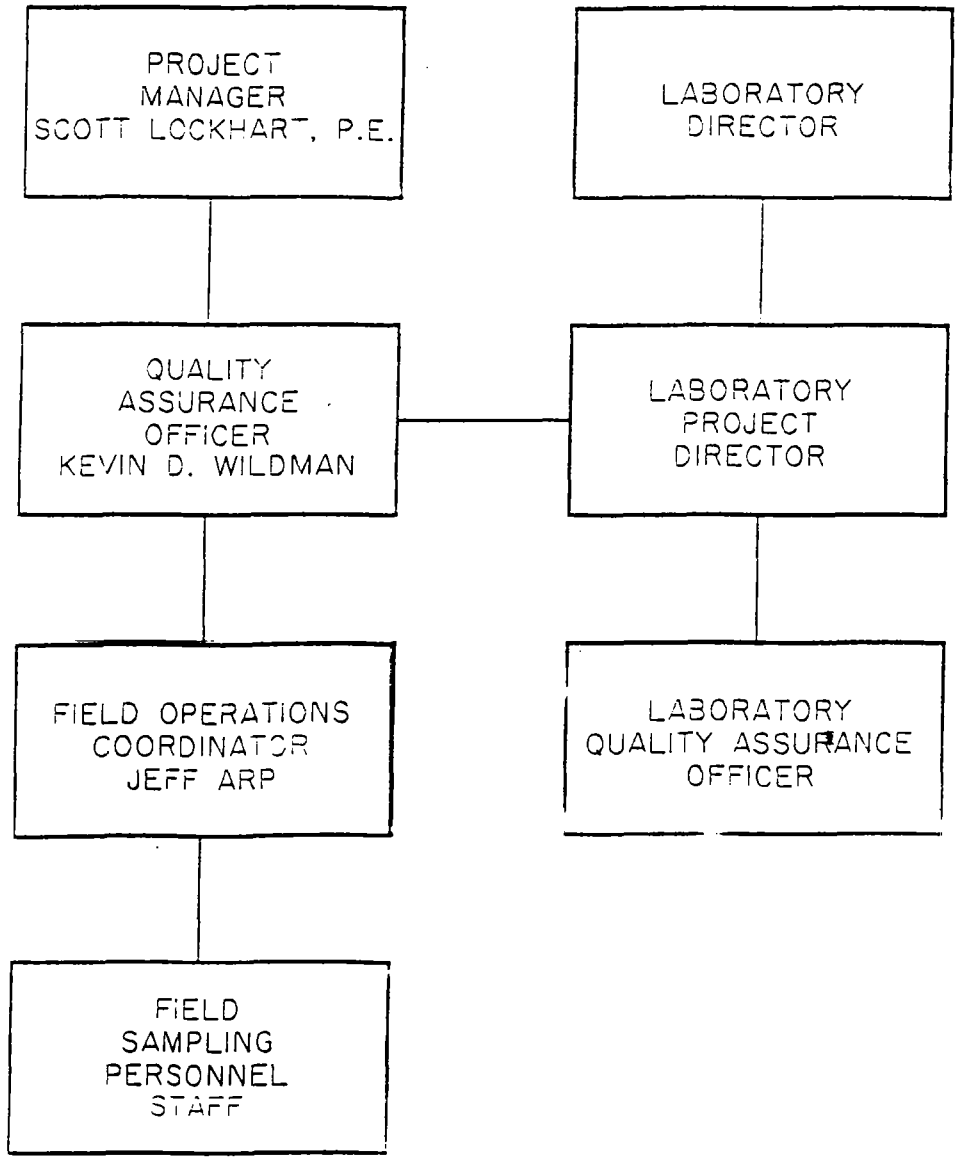


FIGURE C1

Hull & Associates, Inc.
TOLEDO, OHIO

KEER-McGEE CHEMICALS, LLC.
TOLEDO TIE TREATMENT SITE

PROJECT ORGANIZATION CHART
CITY OF TOLEDO, LUCAS CO., OHIO

DATE: FEBRUARY 1998 PWM 001

PWM\15560007
02/19/98 BKAISER

ATTACHMENT A

LANCASTER LABORATORIES' QUALITY ASSURANCE PLAN

LABORATORY QUALITY ASSURANCE PLAN

DECEMBER 12, 1991
REVISED: May 12, 1997

Lancaster Laboratories
A division of Thermo Analytical Inc.

1. Laboratory Quality Assurance Plan

This document provides the laboratory portion of the response to EPA's *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* QAMS-005/80, Sections 5.1 through 5.16 as revised December 29, 1980, and EPA-600/4-83-004, February 1983. Guidance was also obtained from *Preparation Aids for the Development of Category 1 Quality Assurance Project Plans*, Office of Research and Development, USEPA, EPA/600/8-91/003, February 1991.

As much as possible, the procedures in this document have been standardized to make them applicable to all types of environmental monitoring and measurement projects. However, under certain site-specific conditions, all of the procedures discussed in this document may not be appropriate. In such cases it will be necessary to adapt the procedures to the specific conditions of the investigation.

Quality Assurance Officer: Kathleen M. Lowen

3. Project Description

Tests will be performed according to the analytical methodology set forth in the USEPA Contract Laboratory Program Statement of Work*. The USEPA-CLP-SOW provides specific analytical procedures to be used and defines the specific application of these procedures. Proven instruments and techniques will be used to identify and measure the concentrations of volatiles, semivolatiles, and pesticide compounds and/or the inorganic elements. The laboratory will employ state-of-the-art GC/MS and/or GC procedures to perform all organic analyses, including all necessary preparation for analysis. Inorganic analyses will be performed using graphite furnace atomic absorption spectrophotometry (AA), inductively coupled plasma spectroscopy, cold vapor AA, or flame AA. The client is responsible for providing specifics on the project site.

*USEPA-CLP-SOW for Organics, Document No. OLM03.2, USEPA-CLP-SOW for Inorganics, Document No. ILM04.0, or most recent revision unless otherwise requested by the client.

4. Project Organization

The objectives of the laboratory Quality Assurance Program are to establish procedures which will ensure that data generated in the laboratory are within acceptable limits of accuracy and precision, to ensure that quality control measures are being carried out, and to ensure accountability of the data through sample and data management procedures. To this end, a Quality Assurance Department has been established. The Quality Assurance Officer reports directly to the President of Lancaster Laboratories and has no direct responsibilities for data production, thus avoiding any conflict of interest.

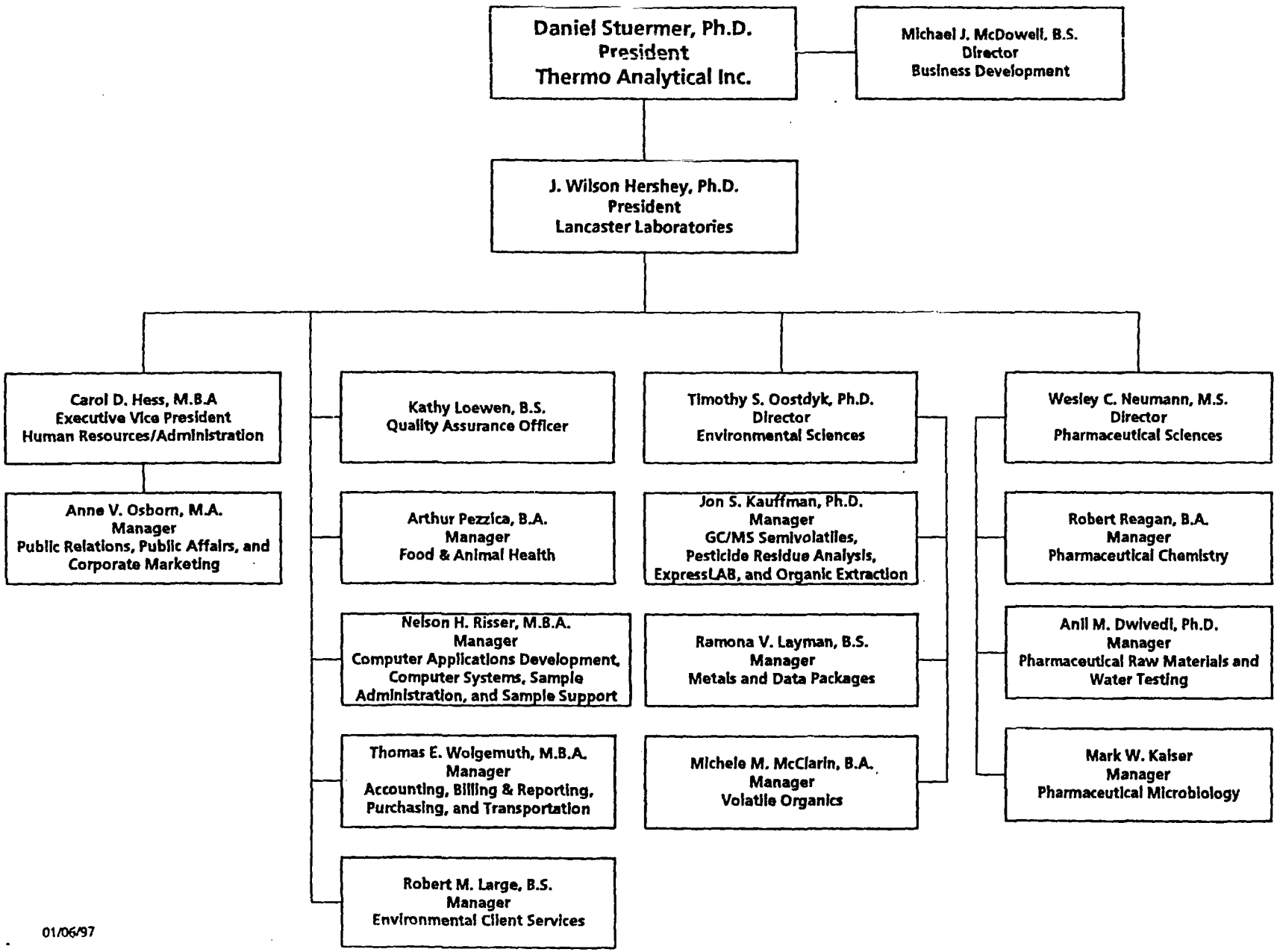
The attached organizational charts show key managerial personnel. Resumes of key individuals may be found in the enclosed *Qualifications Manual.*

The Sample Administration Group will be responsible for receiving samples, signing the external chain of custody, checking sample condition, assigning unique laboratory sample identification numbers, and initiating internal chain-of-custody forms. Sample Support personnel will be responsible for assigning storage locations, checking and adjusting preservation, homogenizing the sample as needed, and sample discard.

Group leaders listed in each technical area are responsible for performing laboratory analyses, quality control as specified in the methods, instrument calibration, and technical data review. Data is reported using a computerized sample management system, which tracks sample progress through the laboratory and generates client reports when all analyses are complete. Quality control data is entered onto the same system for purposes of charting and monitoring data quality.

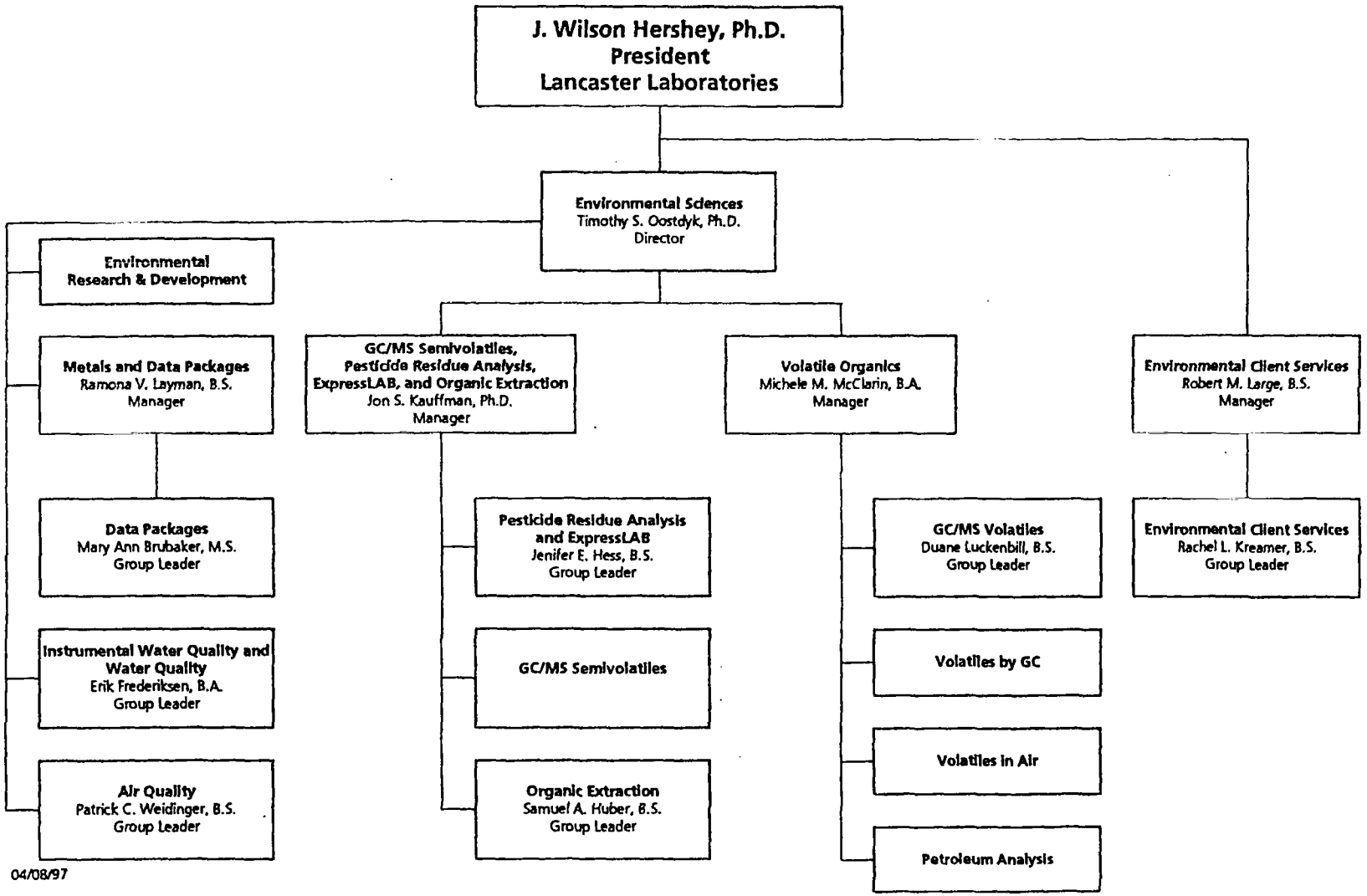
The Quality Assurance Department is responsible for reviewing quality control data, conducting audits in the laboratory and reporting findings to management, maintaining current copies of all analytical methods, maintaining copies of computer code used to calculate and report results, submitting blind samples to the laboratory, and ensuring that appropriate corrective action is taken when quality problems are observed.

Data package deliverables are available upon request. The Quality Assurance Department reviews the contents of the deliverables for completeness and to be sure that all quality control checks were performed and met specifications. This step includes review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, and surrogate results. Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site.


Daniel Stuermer, Ph.D.
President
Thermo Analytical Inc.
Michael J. McDowell, B.S.
Director
Business Development
J. Wilson Hershey, Ph.D.
President
Lancaster Laboratories
Carol D. Hess, M.B.A
Executive Vice President
Human Resources/Administration
Anne V. Osborn, M.A.
Manager
Public Relations, Public Affairs, and
Corporate Marketing
Kathy Loewen, B.S.
Quality Assurance Officer
Arthur Pezzica, B.A.
Manager
Food & Animal Health
Nelson H. Risser, M.B.A.
Manager
Computer Applications Development,
Computer Systems, Sample
Administration, and Sample Support
Thomas E. Wolgemuth, M.B.A.
Manager
Accounting, Billing & Reporting,
Purchasing, and Transportation
Robert M. Large, B.S.
Manager
Environmental Client Services
Timothy S. Oostdyk, Ph.D.
Director
Environmental Sciences
Jon S. Kauffman, Ph.D.
Manager
GC/MS Semivolatiles,
Pesticide Residue Analysis,
ExpressLAB, and Organic Extraction
Ramona V. Layman, B.S.
Manager
Metals and Data Packages
Michele M. McClarin, B.A.
Manager
Volatile Organics
Wesley C. Neumann, M.S.
Director
Pharmaceutical Sciences
Robert Reagan, B.A.
Manager
Pharmaceutical Chemistry
Anil M. Dwivedi, Ph.D.
Manager
Pharmaceutical Raw Materials and
Water Testing
Mark W. Kaiser
Manager
Pharmaceutical Microbiology

01/06/97

Environmental Sciences



04/08/97

5. QA Objectives for Measurement Data

Quality assurance is the overall program for assuring reliability of monitoring and measurement data. Quality control is the routine application of procedures for obtaining set standards of performance in the monitoring and measurement process. Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. The quality of all data generated and processed during this investigation will be assessed for precision, accuracy, representativeness, comparability, and completeness. These specifications will be met through precision and accuracy criteria as specified in Section 11. Detection limits are presented in Section 9.

Precision - Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions. The laboratory objective is to equal or exceed the precision demonstrated for the applied analytical method on comparable samples. The degree of agreement is expressed as the relative percent difference (RPD%). Evaluation of the RPD% is based on the criteria set forth in the Contract Laboratory Program (CLP) for organic and inorganic analyses. External evaluation of precision is accomplished by analysis of standard reference material and interlaboratory performance data.

Accuracy - Accuracy is a measure of the closeness of an individual measurement to the true or expected value. Analyzing a reference material of known concentration or reanalyzing a sample which has been spiked with a known concentration/amount is a way to determine accuracy. Accuracy is expressed as a percent recovery (%R). Evaluation of the %R is based on the criteria established for the CLP for organic and inorganic analyses.

Representativeness - Representativeness expresses the degree to which data accurately represents the media and conditions being measured. The representativeness of the data from the sampling site will depend on the sampling procedure. Sample collection is the responsibility of the client. Samples will be homogenized, if required, as part of the laboratory sample preparation. By comparing the quality control data for the samples against other data for similar samples analyzed at the same time, representativeness can be determined for this objective.

Comparability - Comparability conveys the confidence with which one set of data can be compared to another. The analytical results can be compared to other laboratories by using traceable standards and standard methodology and consistent reporting units. The Laboratory Quality Assurance Program documents internal performance, and the interlaboratory studies document performance compared to other laboratories.

Completeness - Completeness is a measure of the quantity of valid data acquired from a measurement process compared to the amount that was expected to be acquired under the measurement conditions. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. Additional information will be stored in the laboratories archives, both hard copy and magnetic tape. Quality Assurance standard operating procedures (SOPs) are in place to provide traceability of all reported results.

To ensure consistent attainment of the quality assurance objectives, SOPs are in place detailing the requirements for the correct performance of laboratory procedures. The laboratory SOPs fall under five general categories:

1. Corporate policy
2. Quality assurance
3. Sample administration
4. General laboratory procedures
5. Analytical (i.e., methods, standard preps., instrumentation)

All SOPs are approved by the QA Department prior to implementation. The distribution of current SOPs and archiving of outdated ones are controlled through a master file. Table 5-1 provides an index of QA SOPs in place in support of the Quality Assurance objectives. These requirements are supplemented by the procedures in the laboratory and analytical SOPs.

Table 5-1

Document #	Document Title
QA-101	Sample Collection
QA-102	Sample Log-in
QA-103	Sample Storage and Disposal
QA-104	Internal Chain-of-Custody Documentation
QA-105	Analytical Methods Manual
QA-106	Validation and Authorization of Analytical Methods
QA-107	Analytical Methods for Nonstandard Analyses
QA-108	Subcontracting to Other Laboratories
QA-109	Laboratory Notebooks, Logbooks, and Documentation
QA-110	Reagents
QA-111	Instrument and Equipment Calibration
QA-112	Instrument and Equipment Maintenance
QA-113	Data Entry and Verification
QA-114	Data Storage and Security
QA-115	Quality Control Records
QA-116	Investigation and Corrective Action of Unacceptable Quality Control Data
QA-117	Personnel Training Records and Curriculum Vitaes
QA-118	Quality Assurance Audits
QA-119	Proficiency Samples
QA-120	Documentation of Programming for the Sample Management System
QA-121	Guidelines for the Development, Validation, Implementation, and Maintenance of Computer Systems Used with CLP, GLP, and GMP Data
QA-122	Investigation and Corrective Action Reporting for Laboratory Problems

6. Sampling Procedures

In order for meaningful analytical data to be produced, the samples analyzed must be representative of the system from which they are drawn. It is the responsibility of the client to ensure that the samples are collected according to accepted or standard sampling methods.

The laboratory will provide the appropriate sample containers, required preservative, chain-of-custody forms, shipping containers, labels, and seals. The majority of sample containers are purchased precleaned I-Chem™ Series 200 or equivalent. Any reused bottles are cleaned in-house following laboratory standard operating procedures. Special containers with traceability documentation are available upon request. Because the laboratory does not stock this type of container, 1-month prior notice is required.

Each lot of preservative will be documented and checked for contaminants before use. The appropriate bottle will be preserved with the new preservative and filled with deionized water to represent a sample. A similar container (that does not contain preservative) will be filled with deionized water to be used as a blank check. Analysis results are documented for each preservative lot number.

Trip blanks will be prepared by the laboratory and accompany sample containers at the project required frequency. Analyte free water will also be provided for field blanks.

A list of containers, preservatives, and holding times follows in Table 6-1.

Table 6-1

Sample Containers, Preservatives, and Holding Times for Aqueous and Solid Samples

Fraction	Vol. Req (mL) / Wt. Req. (g)	Container P = Plastic G = Glass	Preservation[a]	Holding Time[d] From Date of Receipt[c] Water	Soil
Volatiles	3 x 40 mL / 100 g	G	Cool, 4°C[b] pH <2 w/HCl	10 Days	10
Pesticides	2 x 1000 mL / 100 g	G	Cool, 4°C[b]	5 Days to extraction[e]	10
Acid/Base Neutrals	3 x 1000 mL / 100 g	G	Cool, 4°C[b]	5 Days to extraction[e]	10
Metals	1000 mL / 100 g	P,G	HNO_3 to pH <2	6 Months Hg 26 days	6
Cyanide	1000 mL / 100 g	P,G	Cool, 4°C NaOH to pH >12	12 Days	12

[a]pH Adjustment with acid/base is performed on water samples only.

[b]Sodium thiosulfate needed for chlorinated water samples

[c]Assuming delivery of samples is within 2 days of sampling.

[d]Samples will be analyzed as soon as possible after receipt. The times listed as the maximum times that samples will be held before analysis and still be considered valid.

[e]Extracts of either water or soil/sediment samples must be analyzed within 40 days following extraction.

NOTE: For volatiles analysis, the container should be filled completely, with no headspace. **All sample containers, preservatives, and mailers will be supplied at no additional charge upon request, except for the special containers with traceability documentation. There is an additional charge for this type of container.**

7. Sample Custody

Samples are unpacked and inspected in the sample receipt area. At this time, the samples are examined for breakage and agreement with the associated client paperwork. The cooler temperatures will be checked upon receipt and recorded. As the samples are unpacked, the sample label information will be compared to the chain-of-custody record and any discrepancies or missing information will be documented. If necessary, the cooler will be closed and placed in cold storage until instructions and resolution of any discrepancies are received from the client.

A member of our Sample Administration Group will act as sample custodian for the project. To ensure accountability of our results, a unique identification number is assigned to each sample as soon as possible after receipt at the laboratory. When samples requiring preservation by either acid or base are received at the laboratory, the pH will be measured and documented, with the exception of samples designated for volatile analysis. Samples requiring refrigeration will be stored in our walk-in cooler which is maintained at 2° - 4°C. The use of our computer system in tracking samples (by the Lancaster Labs sample number assignment) will control custody of the sample from receipt until the time of its disposal. The security system on our laboratory building allows us to designate the entire facility as a secure area since all exterior doors are either locked or attended. Therefore, hand-to-hand chain of custody is not part of our routine procedure, but is available upon request. If requested, hand-to-hand chain of custody will be provided as per attached SOP-QA-104, "Chain-of-Custody Documentation." The laboratory chain of custody will begin with the preparation of bottles. The procedures for sample log-in, storage, and chain-of-custody documentation are detailed in the QA standard operating procedures included in Section No. 7 (QA-102, QA-103, and QA-104). Examples of sample labels and a custody seal are shown in Figure 7.1.

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SOP-QA-102.01
Supersedes Date: 02/15/96
Effective Date: MAR 14 1997
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QUALITY ASSURANCE OPERATIONS MANUAL

Sample Log-In

Purpose:

In order to provide accountability of our results, protect client confidentiality, and to prevent sample loss/mix-up, a continuous and unique Lancaster Laboratories (LL) identification number is assigned to each sample upon laboratory receipt.

Scope:

This SOP will cover the procedure used to log client samples into the computerized sample management system (SMS) after receipt. The Sample Administration Group is responsible for laboratory sample log-in. Sample Administration has procedures to define this sample entry process.

This procedure applies only to samples which are logged into and tracked by the SMS. There are only a few cases where samples may not be tracked using the SMS. These include samples which will be stored for a long period of time prior to analysis, (e.g., stability storage) or for special project samples that could be reported in a narrative research and development style report instead of our usual analytical reports. Written procedures for tracking samples not entered into the SMS are developed by the technical department responsible for the project or analysis of those samples.

Personnel Training and Qualifications:

Training in sample log-in is performed in accordance with Sample Administration training procedures.

Procedure:

1. All samples received for testing shall be delivered to the Sample Administration Department immediately upon arrival at the laboratory.

2. The Sample Administration Department will be responsible for unpacking and organizing the samples.

3. Client correspondence relating to the group of samples shall also be transferred to the Sample Administration Department. This may include purchase orders, quotations, letters, phone logs, and Incoming Sample Activity Records (ISARs).

4. Personnel of the Sample Administration Group shall log the samples into the SMS as soon as practical after receipt. Samples awaiting log-in are stored in temporary holding areas, at required temperature, to maintain the sample integrity. At the time of entry the computer will assign a unique identification number to each sample. Samples can be received at the laboratory 7 days a week, 24 hours a day, 365 days of the year. Samples should be logged in on the same day as they are received with the following exceptions:

   a. Samples received on a holiday will not be logged-in until the next normal work day. Samples received from 6 p.m. on Saturday through 11 p.m. on Sunday will be logged-in Sunday evening by third shift Sample Administration personnel.

   b. Samples submitted by clients which do not identify the type of testing to be performed or with unclear or incomplete paperwork documentation - Every effort will be made to contact the client on the same day of sample receipt. In this situation, the samples will be tracked in a hold database. The group of samples will be assigned a hold number. This database is maintained by the Sample Administration Group.

   If same day sample log-in is not possible, all specified and appropriate storage requirements will be observed (e.g., refrigeration).

5. Upon assignment of a sample number, the SMS will generate a label which shall be attached to the sample container. Every effort will be made as to not obscure the client label. The information on the sample label will include the LL sample number, the client name, the storage location, the analyses requested, a bottle code indicating container and preservative type, if applicable, a unique bar code (used for samples stored in the Automated Sample Retrieval and Storage System [ASRS]), and any applicable notes to laboratory personnel.

6. Preservation, homogenization, and subsampling, if necessary, will be the responsibility of the Sample Support Group, or the testing laboratory. SOPs are in place within the group to define these procedures. A list of preservatives required for routine environmental analyses may be found in the *Environmental Schedule of Services.* A preservation, sulfate, and chlorine check shall be performed immediately after sample log-in for all applicable environmental samples.

7. After all above steps are performed, as required, samples shall be stored in an assigned storage location or taken to the laboratory for testing.

8. The next working morning, after sample log-in, a copy of an entry acknowledgment will print from the SMS. The acknowledgment is a hard copy record of the sample entry. It will summarize, the LL sample number, the sample(s) submitted in an entry group, the test(s) to be performed, the client requesting the work, the account to be billed for the work, and the unique sample identifications assigned by the client. This acknowledgment is mailed to the client to confirm sample receipt and entry.

9. Another copy of the sample acknowledgment will print and be designated as the laboratory copy. This acknowledgment, in addition to client paperwork, will audited by three levels of personnel after the entry process:

    a. **Sample Administration** will audit to ensure that the entry corresponds to client supplied paperwork and/or quotations.

b. **Client Services** will audit to ensure the entry is reflective of client documentation and that additional client/project requirements were communicated and taken into consideration. They will also verify that account and billing information is accurate.

c. **Technical centers** will assure appropriate preparation and analysis set-up steps have been added to the entry. They will also verify that project and technical requirements have been taken into consideration from a technical point of view.

Each reviewer will initial the top of the SA file copy of the acknowledgment to document their review. Additional copies of this acknowledgment can be made for laboratory personnel.

10. The LL sample number assigned to each sample shall be used to identify the sample in all laboratory records, including laboratory notebooks, instrument printouts, and laboratory final reports. The sample number will also be used to identify all additional containers of the sample which may be created during sample preparation and analysis. This will include subsamples, extracts, and digests.

Revision Log:

Initiated Date: 03/87

Ver. #	Effective Date	Change
00	02/15/96	Previous issue

Ver. #	Effective Date	Change
01	MAR 1 4 1997	Major changes are as follows:

- Expanded upon the scope of the procedure
- Added section about printing and auditing of the sample entry acknowledgment
- Added Personnel Training and Qualification section
- Removed specifics on how to document preservation checks

SOPQA102.DOC
031197

Prepared by: Kathy D. Wetzel Date: 3/11/97

Approved by: Kathleen M. Lowen Date: 3/11/97

Approved by: J. Wilson Hershey Date: 3/12/97

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QUALITY ASSURANCE OPERATIONS MANUAL
SOP-QA-103

Title: Sample Storage and Disposal

Purpose:

Sample integrity can be compromised by improper storage conditions. The objective of these procedures is to prevent samples from deteriorating prior to analysis. The computerized sample management system (CSMS) is used to assign storage locations and to monitor the orderly storage of samples in locations from which they are easily retrieved for analysis or discard at the appropriate date.

Scope:

This SOP will outline procedures used in storing samples, retrieving and returning samples for analysis, and discarding samples when their holding time expires.

Procedures:

1. Personnel from Sample Administration will designate the approximate size and type (e.g., refrigerator, freezer or room temperature) of sample storage required for each group of samples as they are logged onto the CSMS. The computer will assign the storage location and record the length of time the sample must be retained after the analysis report has been issued. Samples will be stored in the assigned location. If the location is not suitable (e.g., insufficient space), the storage location may be changed using the manual override on the computer. If refrigerated space has been requested and all the computerized refrigerator locations are occupied, samples will be assigned locations in overflow refrigerators and will be tracked using a manual system until computerized locations are available.

2. Analysts requiring the use of a sample may determine its location by referring to the daily sample status sheet. There are varying degrees of security on sample storage locations. The procedures for removal of samples from these locations are as follows:

   a. Free access locations are those which are neither locked nor attended by a sample custodian. These areas are usually located within an individual group's laboratory and samples may be removed from and returned to these locations without documentation. However, if the sample must be taken out of the laboratory, documentation may be requested. Care shall be exercised in returning the sample to its appropriate location.

   b. Controlled access areas are attended by a sample custodian and are usually large areas used by more than one group. Samples stored in controlled access areas can be removed only after requisitioning the sample via the CSMS. The sample custodian will retrieve the requisitioned samples from the storage locations and scan the bar code label. This process documents the sample transfer from the sample custodian to laboratory personnel. After use, the samples are returned to the sample storage center, scanned by the sample custodian and returned to the designated storage location. Only Sample Administration personnel shall be admitted to controlled access areas. The only exception to this rule will be during weekend hours when no sample custodians are on duty. During these hours, samples must be requisitioned as above, but analysts must retrieve the samples themselves by obtaining a key to the controlled access area from the security desk. Samples must be scanned out as above. After use, samples must be scanned in and placed on the return cart inside WK. Sample custodians will return these samples to their location when they come on duty.

c. Locked storage areas are available in several individual lab areas. Access to these storage areas is limited to analysts who are responsible for the analysis of the samples stored there. These areas are locked when the laboratories are unattended; keys are available from members of the department where they are located. Samples are removed and returned as needed by analysts.

d. Forensic storage areas are locked and admission to these areas is permitted only to sample custodians. Most of the samples stored in these areas require strict chain-of-custody documentation as outlined in SOP-QA-104, "Internal Chain-of-Custody Documentation," and should be requisitioned as described in b. above. Samples may not be removed or returned to these areas without signing chain-of-custody forms.

3. To prevent unnecessary deterioration of the samples, the aliquots needed for analysis shall be removed and the sample returned to storage with a minimum of delay.

4. Sample Administration will generate a discard list of samples with retention dates that have expired. The retention dates are based upon client requirements or defaulted to a given number of days past the date when the report is generated, if no client requirements were given. These samples will be removed from storage by a member of Sample Support or a member of the department responsible for the given storage location. Hazardous samples shall either be returned to clients, decontaminated or disposed of at the direction of supervisory personnel. Other samples will be discarded or returned to the client, if requested. Prior to discarding each sample, the bar code will be scanned to prevent discard of the wrong sample.

5. The temperature of each refrigerator or freezer used for storing samples or reagents requiring temperature control should be checked during each normal working day by an assigned member of the group responsible for the

samples stored within and recorded on a log posted on the outside of the unit. Units containing samples requiring more complete documentation of storage conditions are monitored by use of a computerized recording device or a temperature wheel. Refrigerator temperatures should be maintained at 2° to 4°C and freezer temperatures should be maintained at -15° ± 5°C, unless otherwise specified in a client-supplied method or protocol. If the temperature recorded does not fall within these ranges, the Maintenance Department should be contacted. Any repairs should be recorded and filed with the temperature log. All documentation of temperature checks and maintenance shall be kept in ink and any changes made shall follow the error correction procedure given in SOP-QA-109, "Laboratory Notebooks and Documentation."

SOPQA103.DOC
091196

Prepared by: _____ 972 Date: 9/16/96

Approved by: _____ Date: 9/18/96

Approved by: _____ Date: 9/17/96

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QUALITY ASSURANCE OPERATIONS MANUAL

Internal Chain-of-Custody Documentation

Purpose:

In order to demonstrate reliability of data which may be used as evidence in a legal case or required by a regulatory agency or client, an accurate written record tracing the possession of samples must be maintained from the time they are received at the laboratory until the last requested analysis is verified. The chain of custody is to ensure traceability of samples while they are in the possession of the laboratory.

Scope:

Procedures for initiating and maintaining chain-of-custody (COC) documentation are described in this procedure.

Definition:

A sample is in custody if it is in any one of the following states:

1. In actual physical possession.
2. In view after being in physical possession.
3. Locked up so no one can tamper with it.
4. In a secured area, restricted to authorized personnel (e.g., in the ASRS system).

A. Procedure

1. Chain-of-custody documentation shall be kept upon the request of the client or for any samples which are known to be involved in a legal dispute. As with all analytical data, it is **extremely** important that this documentation is filled out completely and accurately with every sample transfer. **Everyone who handles the COC has the responsibility to check for documentation compliance to the point of their acquisition.** If changes need to be made to the form, they shall be made in accordance to the error correction procedure addressed in SOP-QA-109, "Laboratory Notebooks and Documentation." It will be the responsibility of the person who made an error in documentation to correct the error.

2. If requested by the client, the COC documentation will begin with the preparation of sampling containers. A form (Figure 1, attached) will be initiated by the person packing the bottle order for shipment to the client. If the delivery of containers is via Lancaster Laboratories Transportation Department, the driver shall sign the form when they relinquish the bottles to the client. Drivers must also sign COC forms when they pick up samples for analysis.

3. When samples arrive at the laboratory for analysis, a member of the Sample Administration Group will receive them and sign the external COC form that accompanies the samples, if provided. If the samples were picked up by our Transportation Department, the driver must sign the COC to relinquish the samples to sample administration.

4. The Sample Administration Group will track the custody of samples between receipt and entry into the Sample Management System on the SA Receipt Documentation Log (Figure 2, attached). The client's sample designation will be used for identification purposes until a unique Lancaster Laboratories' number is assigned.

5. Samples will be entered into the Sample Management System as described in SOP-QA-102, "Sample Log-in." Sample Administration will enter an analysis number for "Laboratory Chain of Custody" if requested. A lab note will print to inform analysts of the need for COC documentation. This note will also be automatically added to the sample labels.

B. Creating the Internal Chain of Custody

1. Sample Administration personnel shall initiate an internal Laboratory Chain of Custody form at the time of sample entry (Figure 3, attached) for each type of container in the sample group. A master list of all chains created will also be initiated for each sample group at the time of entry (Figure 4, attached). The samples will then be relinquished to a sample custodian who will store the samples in an assigned secure location. This change of custody from sample entry to storage shall be documented on the chain, as well as any interim exchanges for rush analysis, preservation, homogenization, or temporary storage in the SA HOLD. The internal COC forms will then accompany the samples from storage to the laboratory for analysis.

2. If samples need to be checked out from the Sample Administration Group before Lancaster Laboratories' numbers have been assigned to them, SA will be responsible for starting a COC form. They will note the available header information, the samples being relinquished (documented by the client sample designation), and the reason for transfer.

3. After sample entry, the original copy of the external client COC/analysis request form will be filed with Accounts Receivable, to be returned to the client with their invoice. Other copies of the external form will stay within SA to be filed within the client's paperwork file.

C. Documentation of Custody Changes

1. An example of how to document changes in sample custody is shown in Figures 3 and 5. Each change of sample custody must be accurately documented in a consistent format. All signatures documenting changes of custody will use the following format:

   Signatures: first initial, full last name, employee number
   Date: Month/day/year
   Time: Documented as military time
   Ink: Black ink is preferred, red ink and pencil are not acceptable

   a. When sample support releases samples to an analyst they must:

      Note the sample number(s) released, and sign the released by column of the chain.

   b. When an analyst receives samples from sample support they must:

      Sign the received by column, note the date and time samples are received and note the reason why they are taking the samples (reason for change of custody).

   c. When an analyst returns samples to sample support they must:

      Note all sample numbers being returned, sign the released by column, and note time and date of return.

   d. When sample support receives samples from an analyst they must:

      Sign the received by column and note the reason for sample transfer.

2. Sample handling should be kept to a minimum. Analysts requiring use of a sample will requisition it through the computer requisition program. During the hours when sample support is manned by sample custodians, a custodian will receive the computerized requisition and remove the sample from storage. The custodian will ensure that the bottle type listed on the COC form matches the bottle type being distributed. **It will be the shared responsibility of the analyst and sample custodian to insure that forms are signed, dated, and reason for sample transfer are recorded with each change of custody, as directed by Item C1 above.**

3. Each specific test that an analyst performed in conjunction with the associated sample number(s) must be accurately documented by the analyst before the samples are returned to a sample custodian in the sample storage area.

4. When an analyst requires the use of samples when a sample custodian will not be on duty, they must requisition samples earlier in the day or on the previous day. These samples and associated COCs will be pulled by a sample custodian and placed in the locked SA HOLD storage area. The sample custodian will note on the COC the change in transfer to the SA HOLD in addition to the time, date, and the sample numbers. The analyst picking up the samples will document the specific samples being checked out, record SA HOLD in the "Released by" column, sign the Received by column, note the time, date and reason for transfer. When the analyst returns the samples to the SA HOLD, they must sign the samples back into the SA HOLD.

5. The following changes of custody will be handled in the following manner:

   a. Documentation is required for all shift changes. Signatures involving transfers from one shift to another shall be the responsibility of the analyst who originally acquired the samples from sample support.

b. Occasionally a sample container will be needed for analysis by an analyst in a department while it is in the custody of an analyst in another department. It will be the responsibility of the first person who received the sample to note on the COC the specific sample numbers requested by the second person, and to sign the released by column. The second person will sign the received by column and note the time, date, and reason for sample transfer. After the second person is finished with the sample, the sample will be returned back to the first person or to the sample storage area.

c. In situations where a sample group must be split between departments working on different analyses, a supplemental COC must be initiated by the Sample Support Group. The supplemental chain will be used to accompany that portion of the sample group which is needed by a second department, when another department has part of the sample group and the COC for the entire group. This supplemental COC will be created only when absolutely necessary to minimize paperwork and confusion. This chain must also be documented on the master list of chains initiated for the sample group.

d. Some original samples are released by Sample Support or Sample Administration to be stored in other areas of the laboratory (e.g. GC/MS Volatiles, Foods, Pharmaceuticals). During this time they may be accessed by several people in that area. Each of these people must note the specific sample numbers in their custody in addition to date, time, and reason for removal from storage. An example of a COC is attached as Figure 6.

It will be the responsibility of the department who held the samples to assure that all necessary, signatures, dates, times, and reasons for sample custody are noted on the COC forms. It is also very important to return all samples and COCs to storage as soon as possible after data verification, because the chains may be required for a client data packages.

e. If COC samples are stored in other areas of the laboratory or in a specific department, they must be stored in a locked area. When samples are taken from a departmental storage area, the released by column of the COC is documented as "department XX storage." If samples are returned to this area when complete the received by column will be noted as department XX storage.

D. Additional Chain-of-Custody Issues

1. Analysts in possession of samples shall remove the aliquot required for their analysis and return the samples to the Sample Support Group with a minimum of delay. During this time of possession, samples must fall under the definition of sample custody.

2. If additional containers of the sample are created (e.g. subsamples, extracts, distillates, leachates, digests, etc.), an additional COC form must be created by the department if they do not document this information on the original COC form (Figure 5, attached). This form will be marked with the container type and will be initiated to accompany the new sample container. Each department in the lab has specifically designed COC forms which will be used if new containers are created. All changes of custody involving handling of new containers in the department (e.g. analysis, storage, vials on instruments, etc.) will be documented on the departmental specific COC form or on the original COC form. Any specific handling or documentation requirements for departmental chains can be described in a departmental SOP.

E. When Sample Analysis is Complete

1. After sample analysis, samples shall be returned to the Sample Support Group as soon as possible. Original COC forms shall also be returned with the samples and this change of custody noted. At this time it will be the

responsibility of the Sample Support Group to review the COC forms to ensure that all documentation on the forms is complete before they file the forms in their area. Sample custodians will not return a sample to its assigned storage location without signing the accompanying chain and performing this completeness check. All chains should either end with a note of "All Sample Consumed," "Discard" or "Storage" for the final reason of transfer.

2. All completed COC forms for the original sample containers will be retained in files within Sample Support. The Data Package Group will retrieve these forms so a copy can be included in the data package. All departmental created COC forms will be collected by the department's data package group so a copy can be included in the data package. These forms will not be returned to the Sample Support Group since these sample containers will not be returned to the Sample Support Group. The original copy of all COC forms will be retained on file by the laboratory.

3. All personnel who handle sample containers shall make every attempt to ensure that all changes of custody are accurately and completely documented. **Disciplinary action may be taken for employees who fail to comply with these important requirements.**

4. In the event that a signature or other information is inadvertently not recorded on a COC form, the Sample Support and Data Package Groups in conjunction with the technical centers shall determine what information is missing by checking computer requisition records, raw data, or the sample support work schedule. The responsible party shall add the missing information or make the necessary correction at the bottom of the COC form, in addition to noting the situation that caused the error in documentation. The person making this note needs to sign and date the information using the current date. Any errors in COC documentation that cause noncompliances must be noted in the case narrative of the sample data package. Examples of specific cases are on file in the data package department.

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Personnel Training & Qualification:

Training for this procedure consists of reading SOP-QA-104. Supervisory review of all COC documentation should be done until the trainer is satisfied that proficiency has been achieved. Training of all laboratory personnel is the responsibility of the group leader. Documentation that this training has been completed must be kept in the training records.

Revision Log:

Initiated Date: 03/87

Ver. #	Effective Date	Change
00	12/01/95	Previous Issue
01	MAR 1 4 1997	Major changes are as follows:

- Training section added.
- Examples of SA Receipt Documentation Log and Metals Locked Storage COC updated.
- Section E.1., Option to end chain with "All Sample Consumed" added.

SOPQA104.DOC
021997

Prepared by: _____ 972 Date: 2/28/97

Approved by: Kathy D. Wetzel Date: 3/5/97

Approved by: Kathleen M. Lewen Date: 3/5/97

Analysis Request/ Environmental Services Chain of Custody

Lancaster Laboratories
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For LLI use only
Acct. # _____ Sample # _____

Please print. Instructions on reverse side correspond with circled numbers.

(1) Client: _____ Acct. #: _____
Project Name/#: _____ PWSID #: _____
Project Manager: _____ P.O.# _____
Sampler: _____ Quote #: _____
Name of state where samples were collected: _____

(2) Sample Identification	Date Collected	Time Collected	(3) Grab	Composite	Matrix (4): Soil	Water	Potable / NPDES (Check if applicable)	Other	Total # of Containers	(5) Analyses Requested	Remarks	Temperature of samples upon receipt (if immediate) (6)

For LLI use only
FSC: _____
SCR #: _____

(7) Turnaround Time Requested (TAT) (please circle): Normal Rush
(Rush TAT is subject to LLI approval and surcharge.)
Date results are needed: _____
Rush results requested by (please circle): Phone Fax
Phone #: _____ Fax #: _____

(8) Data Package Options (please circle if requested)
QC Summary Type VI
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)

SDG Complete? Yes No

Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)

Internal Chain of Custody required? Yes No

Relinquished by:	Date	Time	Received by:	Date	Time (9)
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300 Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client. 2102 Rev 6/1/95

Figure 1

Figure 1 - Continued

DIRECTIONS FOR COMPLETING THIS FORM

(1) **Client:** Your company's name

Acct. #: Your account number with Lancaster Laboratories

Project Name/#: The way your company refers to the work involved with these samples. You may want to include project location as part of the description.

PWSID: Potable Water Source ID#

Project Manager: The person at your company responsible for overseeing the project

P.O. #: Your company's purchase order number

Sampler: The name of the person who collected the samples

Quote #: The reference number that appears on your quote (if Lancaster Laboratories gave you a number)

State where sample was collected: Please indicate where the sample was taken, e.g., Pa., N.J., etc.

(2) **Sample Identification:** The unique sample description you want to appear on the analytical report

Date Collected/Time Collected: When the sample was collected

(3) **Grab:** Check here if sample was taken at one time from a single spot.

Composite: Check here if samples were taken from more than one spot, or periodically, and combined to make one sample.

(4) **Matrix:** Check the type of sample you are submitting. If it is a water sample, please indicate if it is a potable water or if it is an NPDES sample.

Number of Containers: Indicate the total number of containers for each sampling point.

(5) **Analyses Requested:** Write the name of each analysis (or an abbreviation of it) here, and use the **catalog number** that appears at the beginning of each line in the *Schedule of Services*. Be sure to indicate which analyses are to be performed on which samples.

(6) **Remarks:** List special instructions about the sample here (e.g., hazardous elements, high levels of analyte, etc.). The space can also be used (if needed) for listing additional analyses.

(7) **Turnaround time Requested:** Circle **Normal** if you want routine TAT, which is usually within 10-15 days. If you need your results faster, call ahead to schedule **Rush** work.

Rush Results Requested by: Circle **Fax** or **Phone** and include the number.

(8) **Data Package Options:** Call our Client Services Group (717-656-2301) if you have questions about these choices.

SDG Complete? Indicate **Yes** if this is a complete sample delivery group or **No** if you will be submitting additional samples to be included in the same data package.

Note: We need to have one quality control (QC) sample for every 20 samples you send, if you are requesting site-specific QC. Please give us this sample in triplicate volume and identify it by writing "QC" in the **Remarks** column.

The internal chain of custody is a hand-to-hand documentation recording a sample's movement throughout the company. We routinely start a chain of custody for data-package samples unless we are told otherwise. There is a **$25 per sample** charge for the chain-of-custody documentation.

(9) **Relinquished by/Received by:** The form must be signed each time the sample changes hands. We can supply chain-of-custody seals for the outside of your packages if you require them.

Thank you for using Lancaster Laboratories.
Please call our Client Services Group (717-656-2301) if you have any questions about completing this form.

Figure 2

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Sample Administration
Receipt Documentation Log

Client/Project: XYZ Associates / Well Monitoring COC Seal: (Present) / Not Present on cooler

Date of Receipt: 11/27/95 Broken / (Intact)

Time of Receipt: 1350 Package (Chilled) / Not Chilled

Source Code: 60 Unpacker Emp. No.: 210

Temperature of Samples	
#1	**#2**
Thermometer ID: 123	Thermometer ID:
Corrected Temp.: NA	Corrected Temp.:
(Temp. Bottle) / Surface Temp.	Temp. Bottle / Surface Temp.
(Wet Ice) / Dry Ice / Ice Packs	Wet Ice / Dry Ice / Ice Packs
Ice Present? (Y) N	Ice Present? Y / N
#3	**#4**
Thermometer ID:	Thermometer ID:
Corrected Temp.:	Corrected Temp.:
Temp. Bottle / Surface Temp.	Temp. Bottle / Surface Temp.
Wet Ice / Dry Ice / Ice Packs	Wet Ice / Dry Ice / Ice Packs
Ice Present? Y / N	Ice Present? Y / N

Paperwork Discrepancy/Unpacking Problems: Broken 40 ml vial, client ID 123-01. Client called 1610 11/27/95

Sample Administration Chain of Custody			
Name	**Date**	**Time**	**Reason for Transfer**
K. Grist	11/27/95	1600	Unpacking
A Hutchison	11/27/95	1615	(Place in Storage) or Entry
D. Neslund	11/27/95	1800	(Remove from Storage) / (Entry)
			Place in Storage or Entry
			Entry

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Figure 3
Locked Storage Chain of Custody
Original Sample

Client/Project: XYZ Associates

Preservative: HCl Matrix: Water SDG: XYZ01

Sample # Range of Entry Group: 2420638-39 Bottle Type: #38 40 ml Vial

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody	Dist., Extr., or Digest Chain Created (X)
2420638-39	D. 208 Reslund	SS Storage	11/27/95	1600	Entry & Storage	
2420638-39	SS Storage	B. 705 Weaver	11/28/95	700	Remove from SS Storage	
2420638-39	B. 705 Weaver	dept 21 Storage	11/28/95	715	VOA Storage	
2420638-39	dept 21 Storage	K. 396 Ulitman	11/29/95	1315	VOA Analysis	X
2420638-39	K. Ulitman 396	L. 513 Taylor	11/29/95	1700	VOA Analyst Shift Change	
2420638-39	L. 513 Taylor	dept 21 Storage	11/29/95	2100	VOA Storage	
2420638-39	dept 21 Storage	C. 266 Ayars	12/3/95	800	Transfer to SS Storage	
2420638-39	C. Ayars 266	L. 630 Kessler	12/3/95	815	Storage	

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Figure 4
Master List of Chain of Custodies

Client/Project: XYZ Associates

Sample # Range of Entry Group: 242632-39

SDG: XYZ01 Matrix: (Liquid) Solid Mixed Other

Original Sample Chains		
Bottle Type	**Started By**	**Date Started**
40 ml Glass Vial (#38)	D. Rexlund 208	11/27/95
1000 ml Amber Glass (#45)	↓	↓
1000 ml Plastic (#09)		
1000 ml Amber Glass (#39)		

Supplemental Chains		
Bottle Type	**Started By**	**Date Started**
77	C. Ayars 366	11/27/95
21	C. Ayars 366	11/27/95

Extraction, Digestion, Distillates, Etc.		
Bottle Type	**Started By**	**Date Started**

Figure 5

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Locked Storage Chain of Custody
Metals

Client/Project: XYZ Associates

Sample #: 2420632-9 SDG: XYZ01

Digest Type (circle one): Hg (Metals) GF Hydrides Trial No: 2 (If not 1, fill in)

Batch No: 95305 1849 004

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody
2420632,4,6	S. Correa/523	J. Garrett/428	12/1/95	1631	Metals prep Shift change
2420632,4,6	J. Garrett/428	ICP Storage	12/1/95	1920	ICP Storage
2420632,4,6	ICP Storage	D. Sackett/142	12/1/95	2115	ICP Analysis
2420632,4,6	D. Sackett/142	ICP Storage	12/1/95	2135	ICP Storage.

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Figure 6

Pharmaceutical
Locked Storage Chain of Custody
Original Sample

Client/Project: Smith Pharmaceutical

Preservative: N/A Matrix: Tablets

Sample # Range of Entry Group: 2420320-30

Bottle Type: 40ml Vial

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody
2420320-30	A. Orth Carruthers	M. 589 Coho	12/1/95	1300	Entry / Transfer to Pharm. Storage
2420320-30	M. 589 Coho	Pharm. Storage	12/1/95	1315	Storage
2420320-30	Pharm. Storage	E. Ortiz 572	12/3/95	800	pH Analysis
2420320-30	E. Ortiz 572	Pharm. Storage	12/3/95	1000	Storage
2420320-30	Pharm Storage	D. 330 Wright	12/5/95	930	GC Assay Analysis
2420320-30	D. 330 Wright	Pharm Storage	12/5/95	1400	Storage

8. Calibration Procedures

Procedures for initial calibration and continuing calibration verification are in place for all instruments within the laboratory. The calibrations generally involve checking instrument response to standards for each target compound to be analyzed. The source and accuracy of standards used for this purpose are integral to obtaining the best quality data. Standards used at Lancaster Laboratories are purchased from commercial supply houses either as neat compounds or as solutions with certified concentrations. The accuracy and quality of these purchased standards is verified through documentation provided by these commercial sources. Most solutions and all neat materials require subsequent dilution to an appropriate working range. All dilutions performed are documented and the resulting solution is checked by obtaining the instrument response of the new solution and comparing with the response to the solution currently in use. Any discrepancies between the responses are investigated and resolved before the new solution is used. Each standard is assigned a code which allows traceability to the original components. The standard container is marked with the code, name of solution, concentration, date prepared, expiration date, and the initials of the preparer. Shelf life and storage conditions for standards are included in the standard operating procedures and old standards are replaced before their expiration date.

Each instrument is calibrated with a given frequency using one or more concentrations of the standard solution. As analysis proceeds, the calibration is checked for any unacceptable change in instrument response. If the calibration check verifies the initial response, the analysis proceeds. If the calibration check indicates that a significant change in instrument response has occurred, then a new calibration is initiated. If necessary, maintenance may be performed prior to the recalibration.

Calibration records are usually kept in the form of raw data with the other instrument printouts. In cases where no data system is used, calibration data is manually recorded in notebooks. Any maintenance or repair is also recorded in a notebook. The information recorded either in the notebooks or on the instrument printout includes the date, instrument ID, employee name and/or identification number, and concentration or code number of standard.

The frequency of calibration and calibration verification, number of concentrations used, and acceptance criteria for each of the instruments to be used are listed on Table 8-1. In addition to checking the instrument response to target compounds, the GC/MS units are checked to ensure that standard mass spectral abundance criteria are met. Prior to each calibration, instruments being used for volatile compound analysis are tuned using bromofluorobenzene (BFB) and instruments being used for semivolatile analysis are tuned using decafluorotriphenylphosphine (DFTPP). The key ions and their abundance criteria are listed in Table 8-2.

Table 8-1

Instrument	Initial Calibration			Continuing Calibration Verification		
	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC/MS Volatiles	After C-cal fails	5	Specified compounds must meet contract minimum RRF criteria and max %RSD of ≤20.5%	Every 12 hours	1	Specified compounds must meet contract minimum RRF criteria and max %D of ≤25%
GC/MS Semivolatiles	After C-cal fails	5	Specified compounds must meet contract minimum RRF criteria and max %RSD of ≤20.5%	Every 12 hours	1	Specified compounds must meet contract minimum RRF criteria max %D of ≤25%
GC Pesticides	After C-cal fails	3	%RSD for compounds ≤20% (alpha-BHC and delta-BHC ≤25%) %RSD for surrogates ≤30%	Every 12 hours	1	INDA&B/PEM alternate every 12 hours with %D ≤25. Degradation for DDT, endrin ≤20%, combined ≤30%
Flame AA	Each new run	5	Independent calibration verification within ±10%	Every 10 samples	1	Same as initial
Cold Vapor AA	Each new run	5	Independent calibration verification within ±20%	Every 10 samples	1	Same as initial
ICP	Each new run Max. 60 samples-run	2	Independent calibration verification within ±10%	Every 10 samples	1	Same as initial
Graphite Furnace AA	Every new run	5	Independent calibration verification within ±10%	Every 10 samples	1	Same as initial
Autoanalyzer (cyanide)	Daily	5	Correlation coefficient >0.995	Every 10 samples	1	±10% of original response
Balance	Daily	4	±.5%	N/A	N/A	N/A

Abbreviations

RRF - Relative response factor

%RSD - Percent relative standard deviation

%D - Percent difference

RPD - Relative percent difference

C-cal - Continuing calibration

Flame AA - Flame atomic absorption spectrophotometer

ICP - Inductively coupled plasma spectrophotometer

Graphite Furnace AA - Graphite furnace atomic absorption spectrophotometer

For volatiles, up to two compounds may be outside criteria providing the RRF is ≥0.010 and %RSD ≤40%.

For semivolatiles, up to four compounds may be outside criteria providing the RRF is ≥0.010 and %RSD ≤40%.

For both volatile and semivolatile compounds with no established RRF criteria, the minimum RRF is ≥0.010.

For pesticides, up to two target compounds may have %RSD >20% but ≤ 30%.

Table 8-2	
Mass	Ion Abundance Criteria
BFB Key Ion Abundance Criteria:	
50	8% to 40% of mass 95
75	30% to 66% of mass 95
95	base peak, 100% relative abundance
96	5% to 9% of mass 95
173	less than 2% of mass 174
174	50% to 120% of mass 95
175	4% to 9% of mass 174
176	93% to 101% of mass 174
177	5% to 9% of mass 176
DFTPP Key Ions and Ion Abundance Criteria:	
51	30% to 80% of mass 198
68	less than 2% of mass 69
69	mass 69 relative abundance
70	less than 2% of mass 69
127	25% to 75% of mass 198
197	less than 1% of mass 198
198	Base peak, 100% relative abundance
199	5% to 9% of mass 198
275	10% to 30% of mass 198
365	greater than .75 of mass 198
441	Present but less than mass 443
442	40% to 110% of mass 198
443	15% to 24% of mass 442

9. Analytical Procedures

The analytical procedures to be used for organics are those described in the USEPA CLP Organics SOW OLM03.2 or most recent version and are designed to analyze water, sediment, and soil for the organic compounds on the Target Compound List (TCL). The inorganics procedures are those indicated in the USEPA CLP Inorganics SOW ILM04.0 for the preparation and analysis of water, sediment, and soil samples for the elements on the Target Analyte List (TAL). Copies of the analytical procedures are located in the laboratory and are available for use by analysts. Copies of analytical methods are available upon request.

Volatiles - This method determines the concentration of TCL volatile (purgeable) organics. The analysis is based on purging the volatiles onto a Tenax/silica gel trap, desorbing the volatiles onto a gas chromatographic column which separates them and identifying the separated components with a mass spectrometer. (GC/MS Method.)

Semivolatiles - This method determines the concentration of semivolatile organic compounds that are separated into an organic solvent and are amenable to gas chromatography. The method involves solvent extraction of the sample to isolate analytes and GC/MS analysis to determine semivolatile (BNA) compounds present in the sample.

Pesticides - This method determines the concentration of TCL organochloride pesticides and polychlorinated biphenyls. The procedure includes solvent extraction of the sample, analysis of the extract on a gas chromatograph/electron capture detector (GC/EC) using a megabore capillary column, and confirmation on a GC/EC using a second megabore capillary column. If the compound concentration is sufficient, confirmation may be done by GC/MS upon request.

Inductively Coupled Plasma (ICP) - This is a technique for the simultaneous determination of elements in solution after acid digestion. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Characteristic atomic line emission spectra are produced by excitation of the sample in a radio frequency inductively coupled plasma. Because of the high temperature of the plasma, it is especially useful for refractory metals.

The Trace ICP is the same technique as the ICP listed above except for the orientation of the plasma (horizontal instead of vertical) and upgraded optical and sample introduction systems, resulting in instrument detection limits approximately a magnitude lower than the traditional ICP.

Graphite Furnace Atomic Absorption (GFAA) - This is a method of analysis designed to detect trace amounts of the analyte through electrothermal atomization. Samples are digested before analysis. The graphite furnace is an AA spectrophotometer that heats the sample within a graphite tube using an electrical current (i.e., flameless furnace) and measures the absorption of specific metallic elements at discrete wavelengths.

Flame Atomic Absorption - This method is also suited to metals analysis. A solution of the sample to be analyzed is sprayed into a flame which generates sufficient heat to decompose the sample into its constituent atoms directly in the optical path. The difference in light intensity is measured at specific wavelengths using a spectrophotometer.

Cold Vapor Atomic Absorption - Organic mercury compounds are oxidized and the mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an AA spectrophotometer and absorbance (peak height) is measured.

Total Cyanide Analysis - Cyanide, as hydrocyanic acid, is released from cyanide complexes by means of a reflux-distillation operation and absorbed in a scrubber containing sodium hydroxide solution. The cyanide ion in the absorbing solution is then determined colorimetrically.

Percent Moisture - A known sample weight is placed in a drying oven maintained at 103° to 105°C for 12 to 24 hours. The sample is reweighed after drying and this value is divided by the original weight. The result is used to calculate analytical concentration on a dry-weight basis.

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*						
		Water (µg/L)		Low Soil (µg/kg)		
Volatiles	CAS Number	Quant. Limit	J-Value	Quant. Limt**	J-Value**	Med Soil[a] (µg/kg)**
Chlorornethane	74-87-3	10	3	10	2	1200
Bromornethane	74-83-9	10	3	10	3	1200
Vinyl Chloride	75-01-4	10	2	10	2	1200
Chloroethane	75-00-3	10	3	10	3	1200
Methylene Chloride	75-09-2	10	2	10	2	1200
Acetone	67-64-1	10	6	10	7	1200
Carbon Disulfide	75-15-0	10	3	10	3	1200
1,1-Dichloroethene	75-35-4	10	1	10	2	1200
1,1-Dichloroethane	75-34-3	10	2	10	1	1200
1,2-Dichloroethene (total)	540-59-0	10	2	10	2	1200
Chloroform	67-66-3	10	1	10	1	1200
1,2-Dichloroethane	107-06-02	10	2	10	2	1200
2-Butanone	78-93-3	10	3	10	7	1200
1,1,1-Trichloroethane	71-55-6	10	1	10	1	1200
Carbon Tetrachloride	56-23-5	10	1	10	1	1200
Bromodichloromethane	75-27-4	10	1	10	2	1200
1,2-Dichloropropane	78-87-5	10	1	10	3	1200
cis-1,3-Dichloropropene	10061-01-5	10	1	10	1	1200
Trichloroethene	79-01-6	10	1	10	1	1200
Dibromochloromethane	124-48-1	10	2	10	1	1200
1,1,2-Trichloroethane	79-00-5	10	2	10	2	1200
Benzene	71-43-2	10	1	10	1	1200
trans-1,3-Dichloropropene	10061-02-6	10	1	10	1	1200
Bromoform	75-25-2	10	1	10	1	1200
4-Methyl-2-pentanone	108-10-1	10	5	10	3	1200
2-Hexanone	591-78-6	10	7	10	3	1200
Tetrachloroethene	127-18-4	10	1	10	1	1200
Toluene	108-88-3	10	2	10	1	1200
1 1,2,2-Tetrachloroethane	79-34-5	10	2	10	1	1200

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*						
		Water (µg/L)		Low Soil (µg/kg)		
Volatiles	CAS Number	Quant. Limit	J-Value	Quant. Limt**	J-Value**	Med Soil[a] (µg/kg)**
Chlorobenzene	108-90-7	10	1	10	1	1200
Ethyl Benzene	100-41-4	10	2	10	1	1200
Styrene	100-42-5	10	1	10	1	1200
Xylene (total)	1330-20-7	10	1	10	1	1200

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits and J-values listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight bases as required by the contract, will be higher.

[a]The J-value for the medium-level soil analysis can be determine by multiplying the low-level soil J-value by a factor of 125 and then rounding according to CLP protocol.

J-values are evaluated annually and are subject to change.

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*						
		Water (µg/L)		Low Soil (µg/kg)		
Semivolatiles	CAS Number	Quant. Limit	J-Value	Quant. Limt**	J-Value**	Med Soil[a] (µg/kg)**
Phenol	108-95-2	10	1	330	67	10000
bis(2-Chloroethyl)ether	111-44-4	10	1	330	67	10000
2-Chlorophenol	95-57-8	10	1	330	67	10000
1,3-Dichlorobenzene	541-73-1	10	1	330	33	10000
1,4-Dichlorobenzene	106-46-7	10	1	330	33	10000
1,2-Dichlorobenzene	95-50-1	10	1	330	33	10000
2-Methylphenol	95-48-7	10	2	330	67	10000
2,2'-oxybis(1-Chloropropane)	108-60-1	10	1	330	33	10000
4-Methylphenol	106-44-5	10	2	330	67	10000
N-Nitroso-di-n-dipropylamine	621-64-7	10	1	330	33	10000
Hexachloroethane	67-72-1	10	1	330	33	10000
Nitrobenzene	98-95-3	10	1	330	33	10000
Isophorone	78-59-1	10	1	330	33	10000
2-Nitrophenol	88-75-5	10	1	330	33	10000
2,4-Dimethylphenol	105-67-9	10	2	330	33	10000
bis(2-Chloroethoxy)methane	111-91-1	10	1	330	33	10000
2,4-Dichlorophenol	120-83-2	10	1	330	33	10000
1,2,4-Trichlorobenzene	120-82-1	10	1	330	33	10000
Naphthalene	91-20-3	10	1	330	33	10000
4-Chloroaniline	106-47-8	10	1	330	33	10000
Hexachlorobutadiene	87-68-3	10	1	330	33	10000
4-Chloro-3-methylphenol	59-50-7	10	1	330	33	10000
2-Methylnaphthalene	91-57-6	10	1	330	67	10000
Hexachlorocyclopentadiene	77-47-4	10	1	330	100	10000
2,4,6-Trichlorophenol	88-06-2	10	1	330	33	10000
2,4,5-Trichlorophenol	95-95-4	25	1	830	33	25000
2-Chloronaphthalene	91-58-7	10	1	330	33	10000
2-Nitroaniline	88-74-4	25	1	830	33	25000

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*						
		Water (µg/L)		Low Soil (µg/kg)		
Semivolatiles	CAS Number	Quant. Limit	J-Value	Quant. Limt**	J-Value**	Med Soil[a] (µg/kg)**
Dimethylphthalate	131-11-3	10	1	330	33	10000
Acenaphthylene	208-96-8	10	1	330	33	10000
2,6-Dinitrotoluene	606-20-2	10	1	330	33	10000
3-Nitroaniline	99-09-2	25	1	830	67	25000
Acenaphthene	83-32-9	10	1	330	33	10000
2,4-Dinitrophenol	51-28-5	25	1	830	33	25000
4-Nitrophenol	100-02-7	25	1	830	67	25000
Dibenzofuran	132-64-9	10	1	330	33	10000
2,4-Dinitrotoluene	121-14-2	10	1	330	33	10000
Diethylphthalate	84-66-2	10	1	330	33	10000
4-Chlorophenyl-phenyl ether	7005-72-3	10	1	330	33	10000
Fluorene	86-73-7	10	1	330	33	10000
4-Nitroaniline	100-01-6	25	2	830	33	25000
4,6-Dinitro-2-methylphenol	534-52-1	25	1	830	33	25000
N-nitrosodiphenylamine	86-30-6	10	1	330	33	10000
4-Bromophenyl-phenylether	101-55-3	10	1	330	33	10000
Hexachlorobenzene	118-74-1	10	1	330	33	10000
Pentachlorophenol	87-86-5	25	2	830	100	25000
Phenanthrene	85-01-8	10	1	330	33	10000
Anthracene	120-12-7	10	1	330	33	10000
Carbazole	86-74-8	10	1	330	33	10000
Di-n-butylphthalate	84-74-2	10	1	330	100	10000
Fluoranthene	206-44-0	10	1	330	33	10000
Pyrene	129-00-0	10	1	330	33	10000
Butylbenzylphthalate	85-68-7	10	1	330	33	10000
3,3'-Dichlorobenzidine	91-94-1	10	4	330	33	10000
Benzo(a)anthracene	56-55-1	10	1	330	33	10000
Chrysene	281-01-9	10	1	330	100	10000
bis(2-Ethylhexyl)phthalate	117-81-7	10	1	330	33	10000

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*						
		Water (µg/L)		Low Soil (µg/kg)		
Semivolatiles	CAS Number	Quant. Limit	J-Value	Quant. Limt**	J-Value**	Med Soil[a] (µg/kg)**
Di-n-octylphthalate	117-84-0	10	1	330	33	10000
Benzo(b)fluoranthene	205-99-2	10	1	330	33	10000
Benzo(k)fluoranthene	207-08-9	10	1	330	33	10000
Benzo(a)pyrene	50-32-8	10	1	330	33	10000
Indeno(1,2,3-cd)pyrene	193-39-5	10	1	330	33	10000
Dibenz(a,h)anthracene	53-70-3	10	1	330	33	10000
Benzo(g,h,i)perylene	191-24-2	10	1	330	67	10000

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits and J-values listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry-weight bases as required by the contract, will be higher.

[a]The J-value for the medium-level soil analysis can be determined by multiplying the low-level soil J-value by a factor of 30.3.

J-values are evaluated annually and subject to change.

Target Compound List (TCL) and Contract Required quantitation Limits (CRQL)*					
		Water (µg/L)		Low Soil (µg/kg)	
Pesticides/PCBs	CAS Number	Quant. Limit	J-Value	Quant. Limt**	J-Value**
alpha-BHC	319-84-6	0.05	0.0033	1.7	0.1
beta-BHC	319-85-7	0.05	0.0055	1.7	0.4
delta-BHC	319-86-8	0.05	0.013	1.7	0.1
gamma-BHC (Lindane)	58-89-9	0.05	0.0027	1.7	0.4
Heptachlor	76-44-8	0.05	0.002	1.7	0.1
Aldrin	309-00-2	0.05	0.002	1.7	0.1
Heptachlor epoxide	1024-57-3	0.05	0.0031	1.7	0.1
Endosulfan I	959-98-8	0.05	0.02	1.7	0.1
Dieldrin	60-57-1	0.10	0.015	3.3	0.1
4,4'-DDE	72-55-9	0.10	0.013	3.3	0.1
Endrin	72-20-8	0.10	0.018	3.3	0.2
Endosulfan II	33213-65-9	0.10	0.0084	3.3	0.3
4,4'-DDD	72-54-8	0.10	0.029	3.3	0.4
Endosulfan sulfate	1031-07-8	0.10	0.021	3.3	0.2
4,4'-DDT	50-29-3	0.10	0.015	3.3	0.1
Methoxychlor	72-43-5	0.50	0.12	17.0	1.
Endrin ketone	53494-70-5	0.10	0.018	3.3	0.2
Endrin aldehyde	7421-36-3	0.10	0.018	3.3	0.2
alpha-Chlordane	5103-71-9	0.05	0.0028	1.7	0.1
gamma-Chlordane	5103-74-2	0.05	0.0031	1.7	0.1
Toxaphene	8001-35-2	5.0	0.2	170.0	10.
Aroclor-1016	12674-11-2	1.0	0.14	33.0	3.
Aroclor-1221	11104-28-2	2.0	0.24	67.0	8.
Aroclor-1232	11141-16-5	1.0	0.2	33.0	5.
Aroclor-1242	53469-21-9	1.0	0.51	33.0	6.
Aroclor-1248	12672-29-6	1.0	0.16	33.0	3.
Aroclor-1254	11097-69-1	1.0	0.04	33.0	4.
Aroclor-1260	11096-82-5	1.0	0.15	33.0	2.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits and J-values listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry-weight bases as required by the contract, will be higher.

J-values are evaluated annually and are subject to change.

Inorganic Target Analyte List (TAL)	
Analyte	**Contract Required Detection Limit** (µg/L)**
Aluminum	200
Antimony	60
Arsenic	10*
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3*
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5*
Silver	10
Sodium	5000
Thallium	10*
Vanadium	50
Zinc	20
Cyanide	10

*Graphite furnace or Trace ICP required.

**The CRDLs are the minimum levels of detection acceptable under the CLP SOW procedures. The detection limits for samples may be considerably higher depending on the sample matrix.

Instrument Detection Limits (IDLs) are available upon request. IDLs are instrument specific and updated quarterly.

10. Data Reduction, Validation, and Reporting

Raw analytical data generated in the laboratories is collected on printouts from the instruments and associated data system or manually in bound notebooks. Analysts review data as it is generated to determine that the instruments are performing within specifications. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks described in Sections No. 8 and No. 11. If any problems are noted during the analytical run, corrective action is taken and documented.

Each analytical run is reviewed by a chemist for completeness and accuracy prior to interpretation and data reduction. The following calculations are used to reduce raw data to reportable results.

GC/MS calculation used by the data system to determine concentration in extract for **semivolatiles** or in the sample itself for **volatiles**:

$$Q = (Ax)\,(Is)/(Ais)\,(RRF)\,(Vi)$$

Where:

Ax = Peak area

Ais = Internal standard peak area

Is = Amount of internal standard injected (ng)

RRF = Relative response factor

Vi = Volume of extract injected (L) or volume sample purged (mL)

The extract concentration is further reduced by considering the initial sample weight or volume and the final extract volume:

$$Concentration = (Q)\ (D)\ (F)\ (1000)/(I)$$

Where:

Q = Concentration determined by the data system (mg/L)

D = Dilution factor if needed

F = Final extract volume (mL)

I = Initial sample weight (grams) or volume (mL)

Results are reported in µg/L for water samples and µg/kg for solid samples. Soil samples are reported on an as received and on a dry-weight basis. The results are reported on Form I shown in Appendix A.

The results for the **pesticides/PCBs** analysis are calculated using the following equation:

$$Concentration = (Ax)\ (Is)\ (Vt)\ (DF)/(As)\ (Vi)\ (Vs)$$

Where:

Ax = Peak height for the parameter being measured

Is = Amount of standard injected (ng)

Vt = Volume of total extract (µL)

DF = Dilution factor, if needed

As = Peak height for the external standard

Vi = Volume of extract injected (µL)

Vs = Volume (mL) or weight (gm) of sample extracted

Results are reported as µg/L for water samples and mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Form I shown in Appendix A.

The results for **inorganic** analyses are calculated using the following equation:

$$Concentration = (A)(D)(E)(1000) / (F)$$

Where:

A = The concentration determined by AA, ICP, or FTIR using calibration data programmed into the instrument (mg/L)

D = Dilution factor if needed

E = Final extract volume (mL)

F = Initial sample volume (mL) or weight (gm)

Results are usually reported in µg/L for water samples and in mg/kg for solid samples. Soil samples are reported on a dry-weight basis. The results are reported on Form I shown in Appendix A.

The principle criteria used to validate data will be the acceptance criteria described in Sections No. 8 and 11 and protocols specified in laboratory SOPs. Following review, interpretation, and data reduction by the analyst, data is transferred to the laboratory sample management system either by direct data upload from the analytical data system or manually. This system stores client information, sample results, and QC results. A security system is in place to control access of laboratory personnel and to provide an audit trail for information changes. The data is again reviewed by the group leader or another analyst whose function is to provide an independent review and verified on the sample management system. The person performing the verification step reviews all data including quality control information prior to verifying the data. Any errors identified and corrected during the review process are documented and addressed with appropriate personnel to ensure generation of quality data. If data package deliverables have been requested, the laboratory will complete the appropriate forms (see Appendix A) summarizing the quality control information, and transfer copies of all raw data (instrument printouts, spectra, chromatograms, laboratory notebooks, etc.) to the

Data Packages Group. This group will combine the information from the various analytical groups and the analytical reports from the laboratory sample management system into one package in the client requested format. This package is reviewed by the Quality Assurance Department for conformance with SOPs and to ensure that all QC goals have been met. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

The validation of the data by the Quality Assurance Department includes spot checking raw data versus the final report, checking that all pertinent raw data is included and does refer to the samples analyzed, review of all QC results for conformance with the method, and review of the case narrative for description of any unusual occurrences during analysis. This validation is performed using techniques similar to those used by the Sample Management Office for the USEPA's Contract Laboratory Program. The validation performed by the laboratory does not address usability of the data, which usually requires some knowledge of the site. The laboratory will make every attempt to meet the requirements of this QAPP, thus reducing the need to assess usability of the data.

The laboratory sample management system is programmed to accept and track the results of quality control samples including blanks, surrogates, recoveries, duplicates, controls, and reference materials. The computer is programmed with the acceptance criteria for each type of QC sample and will display an out-of-spec message if the data is not within specifications. All data outside of specifications appears on a report to the Quality Assurance Department on the next working day. These are reviewed by the Quality Assurance Department for severity of the problems and trends in the data. The reports are then sent to the analytical groups for the purpose of documenting the corrective action taken. The sample management system also produces control charts and has searching capabilities to aid in data review. The flow of data from the time the samples enter the laboratory until the data is reported are summarized in Table 10-1.

Any data recorded manually will be collected in bound notebooks. All entries will be in ink, with no erasures or white-out being permitted. Any changes in data will be made using a single line to avoid obliteration of the original entry and will be dated and signed. Any data resulting from instrument printouts will be dated and will contain the signature and/or identification of the analyst responsible for its

generation. After copies of the data are incorporated into the data package deliverables, the originals will be stored in locked archives at the laboratory for a period of 7 years.

Project files will be created per client/project and will contain chain-of-custody records, analysis requirements, and laboratory acknowledgments which document samples received, laboratory sample number assignment, and analysis requested. Raw data is filed per batch number assignment and laboratory sample number which correlates to the sample receipt documents. When the project is complete, all documentation is archived in a limited access area and retained for 5 years.

Table 10-1

Sample and Data Routing at Lancaster Laboratories

Action	Personnel Involved
Sample received at Lancaster Labs	Sample Administration
Sample is entered onto sample management system (lab ID number assigned, analyses scheduled, chain of custody started, storage location assigned)	Sample Administration
Sample stored in assigned location (refrigerator, freezer, etc.)	Sample Support
Acknowledgment sent to client	Sample Administration
Removed from storage for analysis; necessary aliquot taken and sample returned to storage	Technical Personnel
Analysis is performed according to selected analytical method; raw data recorded, reviewed, and transferred to computer by chemist or technician*	Technical Personnel
Computer performs calculations as programmed according to methods	Data Processing
Chemist or supervisor verifies raw data	Technical Personnel
Data package deliverables are assembled	Data Package Group
Data packages are reviewed prior to mailing	Quality Assurance Dept. Laboratory Management

*Analyses requiring the chemist's interpretation may involve manual data reduction prior to entry onto the computer.

11. Internal Quality Control Checks

The particular types and frequencies of quality control checks analyzed with each sample are defined in USEPA CLP SOW OLM03.2 for organics and in CLP SOW ILM04.0 for inorganics or most recent revision, along with the limits of acceptance or rejection. The quality control checks routinely performed during sample analysis include surrogates, matrix spikes, duplicates, blanks, and internal standards. In addition to these checks, inorganic analyses employ serial dilutions, interference check samples, and laboratory control samples.

Surrogates (used for organic analysis only) - Each sample, matrix spike, matrix spike duplicate, and blank are spiked with surrogate compounds prior to purging and extraction in order to monitor preparation and analysis. Surrogates are used to evaluate analytical efficiency by measuring recovery.

Matrix Spikes - A matrix (soil or water) is spiked with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

Duplicates (matrix spike duplicate - organics; duplicate - inorganics) - A second aliquot of a matrix/sample is analyzed at the same time as the original sample in order to determine the precision of the method. Recovery of the original compared to the duplicate is expressed as relative percent differences (RPD).

Blanks (method, storage, instrument) - Blanks are an analytical control consisting of a volume of deionized, distilled laboratory water for water samples and all storage and instrument blanks, or a purified solid matrix for soil/sediment samples. (Metals use a digested reagent blank with soils.) They are treated with the same reagents, internal standards, and surrogate standards and carried through the entire analytical procedure. The blank is used to define the level of laboratory background contamination.

Internal Standards (used for GC/MS analysis) - Internal standards are compounds added to every standard, blank matrix, spike, matrix spike duplicate, and sample at a known concentration, prior to analysis. Comparison of the peak areas of the internal standards are used for internal standard quantitation as well as to determine when changes in the instrument response will adversely affect quantification of target compounds.

Serial Dilutions (used for inorganic ICP analysis) - If the analyte concentration is sufficiently high (≥50× IDL) an analysis of a five-fold dilution must agree within 10% of the original determination. If the dilution analysis is not within 10%, a chemical or physical interference effect should be suspected.

Interference Check Sample (used for inorganic ICP analysis) - To verify interelement and background correction factors a solution containing both interfering and analyte elements of known concentration is analyzed at the beginning and end of each analysis run and per 20 samples.

Laboratory Control Samples (used for inorganic analysis) - Aqueous and solid control samples of known composition are analyzed using the same sample preparation, reagents, and analytical methods employed for the sample. LCS recovery must fall within established control limits.

The results of quality control samples are entered into the computer along with sample results. The computer is programmed to compare the individual values with the acceptance limits. If the results are not within the acceptance criteria, appropriate corrective action is taken where necessary. Management is kept informed by daily reports of QC outliers generated by the computerized system. Monthly reports on results of all QC analyses showing mean and standard deviation will indicate trends or method bias. Control charts are plotted via computer and may be accessed at any time by all analysts.

The tables that follow show the types and frequency of QC performed, along with the acceptance limits and corrective action.

Table 11-1

Quality Control
GC/MS Volatiles

Type	Acceptance Limits(%) WATERS	SOILS	Frequency	Corrective Action
Surrogates:			Each sample, MS, MSD, and blank	Reanalyze sample if outside limits; if reanalysis confirms original, document on report and/or case narrative
Toluene-d8	88 - 110	84 - 138		
Bromofluorobenzene	86 - 115	59 - 113		
1,2-Dichloroethane-d4	76 - 114	70 - 121		
Matrix Spikes:			Each group (≤20) of samples per matrix/level	Advisory Only Evaluated by analyst in relationship to other QC results
1,1-Dichloroethene	61 - 145	59 - 172		
Trichloroethene	71 - 120	62 - 137		
Benzene	76 - 127	66 - 142		
Toluene	76 - 125	59 - 139		
Chlorobenzene	75 - 130	60 - 133		
Matrix Spike Duplicates (RPD):			Each group (≤20) of samples per matrix/level	Advisory Only Evaluated by analyst in relationship to other QC results
1,1-Dichloroethene	14	22		
Trichloroethene	14	24		
Benzene	11	21		
Toluene	13	21		
Chlorobenzene	13	21		
Blanks:	<(2.5×) CRQL for methylene chloride <(5×) CRQL for acetone and 2-butanone <CRQL for all other compounds		Once for each 12-hour time period	Reanalyze blank and associated samples if blank outside limits
Internal Standards:	-50% to +100% of internal standard area of 12-hour STD RT Change ≤30 sec.		Each sample, MS, MSD, and blank	Reanalyze samples; if reanalysis confirms original, document on report or case narrative
Bromochloromethane				
1,4-Difluorobenzene				
Chlorobenzene-d5				

Some of the CLP recovery limits are advisory limits only. If in the opinion of the analyst, a problem exists other than matrix, the samples will be reanalyzed.

Table 11-2

Quality Control
GC/MS Semivolatiles

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Surrogate:			Each sample, MS, MSD, and blank	Repeat analysis if more than one surrogate out per fraction (acid/base) or any recovery <10%; if reanalysis confirms originals, document on report and/or case narrative
Nitrobenzene-d5	35 - 114	23 - 120		
2-Fluorobiphenyl	43 - 116	30 - 115		
Terphenyl-d14	33 - 141	18 - 137		
Phenol-d5	10 - 110	24 - 113		
2-Fluorophenol	21 - 110	25 - 121		
2,4,6-Tribromophenol	10 - 123	19 - 122		
2-Chlorophenol-d4	33 - 110	20 - 130	(Advisory)	
1,2-dichlorobenzene-d4	16 - 110	20 - 130	(Advisory)	
Matrix Spikes:			Each group (≤20) of samples per matrix/level	Advisory Only Evaluated by analyst in relationship to other QC results
Phenol	12 - 110	26 - 90		
2-Chlorophenol	27 - 123	25 - 102		
1,4-Dichlorobenzene	36 - 97	28 - 104		
N-Nitroso-di-n-propylamine	41 - 116	41 - 126		
1,2,4-Trichlorobenzene	39 - 98	38 - 107		
4-Chloro-3-methylphenol	23 - 97	26 - 103		
Acenaphthene	46 - 118	31 - 137		
4-Nitrophenol	10 - 80	11 - 114		
2,4-Dinitrotoluene	24 - 96	28 - 89		
Pentachlorophenol	9 - 103	17 - 109		
Pyrene	26 - 127	35 - 142		
Matrix Spike Duplicates (RPD):			Each group (≤20) of samples per matrix/level	Advisory Only Evaluated by analyst in relationship to other QC results
Phenol	42	35		
2-Chlorophenol	40	50		
1,4-Dichlorobenzene	28	27		
N-Nitroso-di-n-propylamine	38	38		
1,2,4-Trichlorobenzene	28	23		
4-Chloro-3-methylphenol	42	33		
Acenaphthene	31	19		
4-Nitrophenol	50	50		
2,4-Dinitrotoluene	38	47		
Pentachlorophenol	50	47		
Pyrene	31	36		
Blanks:	<(5×) CRQL for the phthalate esters in the TCL <CRQL for all other TCL compounds		Once per case or group (≤20) of samples, each matrix, level, instrument	Reextract and reanalyze blank and associated samples

Table 11-2

Quality Control
GC/MS Semivolatiles

Type	Acceptance Limits (%) WATERS SOILS	Frequency	Corrective Action
Internal Standards: 1,4-Dichlorobenzene-d4 Naphthalene-d8 Acenaphthene-d10 Phenanthrene-d10 Chrysene-d12 Perylene-d12	-50% to +100% of internal standard area of 12-hour STD RT change ≤30 sec.	Each sample, MS, MSD, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative

Some of the CLP recovery limits are advisory limits only. If in the opinion of the analyst, a problem exists other than matrix, the sample will be reanalyzed.

Table 11-3

Quality Control
Pesticides/PCBs

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Surrogates:			Added to each sample, MS/MSD, and blank during the extraction phase	Advisory Only for Samples For Blank, reinject; if still out reextract and reanalyze blank and associated samples
Tetrachloro-*m*-xylene	30 - 150	30 - 150		
Decachlorobiphenyl	30 - 150	30 - 150		
Matrix Spikes:			Each extraction group (≤20) of samples per matrix/level	Advisory Only Evaluated by analyst in relationship to other QC results
gamma-BHC (Lindane)	56 - 123	46 - 127		
Heptachlor	40 - 131	35 - 130		
Aldrin	40 - 120	34 - 132		
Dieldrin	52 - 126	31 - 134		
Endrin	56 - 121	42 - 139		
4,4'-DDT	38 - 127	23 - 134		
Matrix Spike Duplicates (RPD):			Each group (≤20) of samples per matrix/level	Advisory Only Evaluated by analyst in relationship to other QC results
gamma-BHC (Lindane)	15	50		
Heptachlor	20	31		
Aldrin	22	43		
Dieldrin	18	38		
Endrin	21	45		
4,4'-DDT	27	50		
Blanks:	<CRQL for any TCL compounds <(.5×) the CRQL for instrument blanks		Once per case or extraction group (≤20) of samples, each matrix, level, instrument	Inject a hexane or solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected if they, too, contain the analyte which was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be reprepped.

Some of the CLP recovery limits are advisory limits only. If in the opinion of the analyst, a problem exists other than matrix, the sample will be reanalyzed.

Table 11-4

Quality Control
Inorganics

Type	Acceptance Limits (%) WATERS SOILS	Frequency	Corrective Action
Matrix Spikes:	75% to 125% except where sample conc. exceeds spike conc. by ≥4×	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample
Duplicates (RPD):	±20% RPD for sample values ≥5× CRDL	Each group of samples of similar matrix/level (≤20) each method	Flag the data
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB)	≤CRQL	Each wavelength immediately after calibration verification at 10% frequency or every 2 hours (beginning and end of run min.)	Correct problem, recalibrate, and rerun
Preparation Blank	≤CRDL >CRDL then lowest conc. in sample must be 10× blk. conc. or <CRDL	Each SDG or batch (≤20 samples)	Redigest and reanalyze blank and associated samples if sample result <10× blank result
Serial Dilutions:	Within ±10% of the original determination	Each group of (≤ 20) of similar matrix/level	Flag the data
Interference Check Sample:	Solution A - ± (2×) CRDL of the true value for analytes with CRDLs of ≤10 µg/L Solution AB - ±20% of the true value for the analytes	Each wavelength after Initial Calibration Verification at beginning and end of the run and per 20 samples	Recalibrate the instrument
Laboratory Control Sample:	Aqueous 80% to 120% (except Ag and Sb) Solids see Table 11-15	Each SDG or batch (≤20 samples), each method	Redigest and reanalyze LCS and associated samples
Post Digestion Spike:	85% to 115%	When matrix spikes are outside 75% to 125% range (not performed on GFAA analyses)	Flag the data
Analytical Spike:	85% to 115%	Every GFAA determination	See Figure 11-1

Table 11-5

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PriorityPollutnT™/CLP Inorganic Soils — Quality Control Standards

Catalog Nº PPS-46 — Lot Nº 229

Parameter	Certified Value	Performance Acceptance Limits™
TRACE METALS PriorityPollutnT™ (Catalog No 540)	mg/Kg	mg/Kg
aluminum	4590	2280 - 7590
antimony	39.8	6.37 - 119
arsenic	75.4	37.1 - 112
barium	106	74.3 - 139
beryllium	51.0	11.7 - 90.3
boron	94.1	26.9 - 161
cadmium	45.4	11.9 - 79.0
calcium	1290	875 - 1750
chromium	71.0	38.0 - 100
cobalt	49.6	29.8 - 70.5
copper	112	63.9 - 162
iron	9160	5560 - 13000
lead	53.5	28.1 - 75.9
magnesium	1160	691 - 1670
manganese	154	107 - 208
mercury	1.50	0.389 - 2.35
molybdenum	47.4	29.2 - 70.2
nickel	39.4	21.5 - 57.5
potassium	1420	880 - 1870
selenium	72.3	37.8 - 108
silver	116	53.2 - 170
sodium	198	111 - 287
strontium	109	46.3 - 173
thallium	40.0	20.0 - 60.0
tin	102	35.9 - 168
titanium	230	60.0 - 400
vanadium	65.9	32.0 - 88.9
zinc	134	72.2 - 199
CYANIDE PriorityPollutnT™ (Catalog No 541)	mg/Kg	mg/Kg
total cyanide	323	123 - 559

The ***Trace Metals Certified Values*** are equal to the mean recoveries for each parameter as determined in an interlaboratory round robin study. The standard was digested using Method 3050, SW-846 and the digest analyzed by ICP and atomic absorption spectroscopy.

The ***Cyanide Certified Value*** is equal to the mean recovery as determined in an interlaboratory round robin study. The standard was distilled and analyzed following the procedure outlined in Method 9010, SW-846.

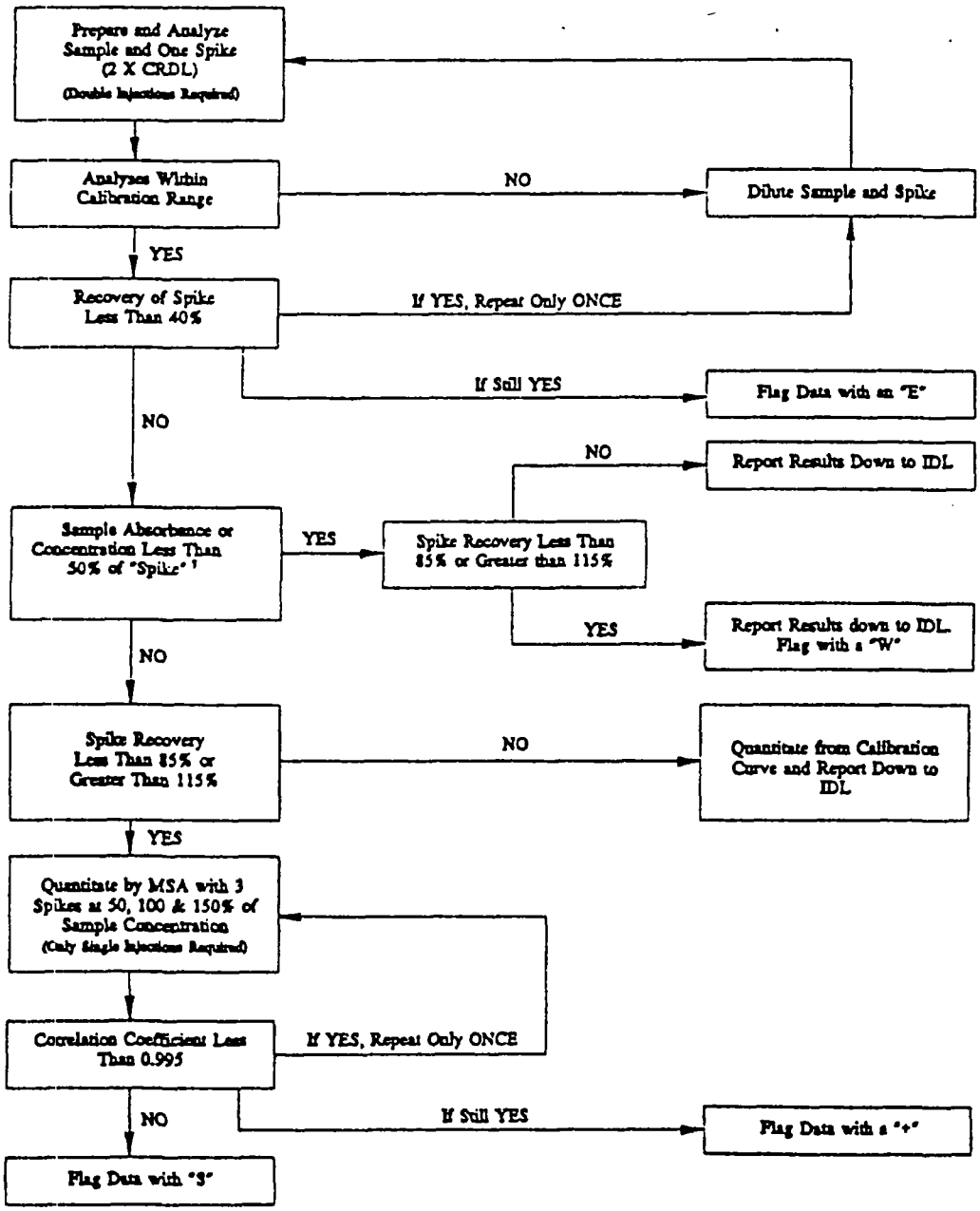
The ***Performance Acceptance Limits (PALs™)*** are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. The PALs™ are based on data generated by your peer laboratories in ERA's InterLaB™ program using the same samples you are analyzing and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PALs™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

For users of internal standards, ERA has determined that scandium is present in this soil at 1.66 mg/Kg and that yttrium is present at 9.43 mg/Kg.

*Each lot of standards will have different certified values and the advisory range will be adjusted accordingly.

Figure 11-1

FIGURE 1. FURNACE ATOMIC ABSORPTION ANALYSIS SCHEME



12. Performance and System Audits

System audits are conducted on each department at Lancaster Laboratories by members of the Quality Assurance Department. The audits include checks on methodology, reagent preparation, equipment calibration and maintenance, quality control results, and training of personnel. The results of the audits and corrective action, where necessary, are communicated to laboratory personnel and management by means of a written report. Audits by outside organizations including clients, regulatory personnel, and the USEPA are permitted by arrangement with the Quality Assurance Department.

The Quality Assurance Department reviews summaries of the quality control data entered onto the computerized sample management system by analysts. Control charts and statistics are reviewed for trends which may indicate problems with the analytical data. In this way, small problems are identified before they have any significant impact on laboratory results.

Performance audits consist of both intralaboratory and interlaboratory check samples. QC samples from commercial suppliers are analyzed quarterly to assess laboratory accuracy including a double blind program. The Laboratory also participates in a number of interlaboratory performance evaluation studies which involve analysis of samples with concentrations of analytes that are known to the sponsoring organization, but unknown to the laboratory. Inorganics, pesticide/herbicides, trihalomethanes, volatile organic compounds, semivolatile organic compounds, and traditional wet chemistry analyses are analyzed by Lancaster Labs for studies conducted by the USEPA and the New York Department of Health. Lancaster Labs has participated in the USEPA Contract Laboratory Program which provides laboratory analysis in support of the Superfund program. Part of maintaining this contract includes analysis of quarterly blind samples. Representative results from some of these studies are attached to this section.

LANCASTER LABORATORIES
Account # 7176562301 ID # LANC
LANCASTER PA GCL

Report: PE006
Performance Evaluation Report — Page: 1
USEPA Water Supply Study WS037 — Date: 06SEP96

Participant ID: PA00009 Type: OTHER Requesting Office: UT

Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
TRACE METALS IN MICROGRAMS PER LITER:				
001-ARSENIC				
001	049.0	49.3	41.9- 56.3	Accept.
002-BARIUM				
002	0771.	773	657- 889	Accept.
003-CADMIUM				
001	C10.2	10.2	8.16- 12.2	Accept.
004-CHROMIUM				
001	071.5	72.9	62- 83.8	Accept.
005-LEAD				
001	013.2	13.8	9.66- 17.9	Accept.
006-MERCURY				
001	07.70	8.16	5.71- 10.6	Accept.
007-SELENIUM				
001	051.3	57.9	46.3- 69.5	Accept.
091-COPPER				
001	054.0	55.7	50.1- 61.3	Accept.
140-ANTIMONY				
002	021.4	18.0	12.6- 23.4	Accept.
141-BERYLLIUM				
001	03.27	4.26	3.62- 4.9	Not Accept.
142-NICKEL				
001	055.9	55.0	46.8- 63.3	Accept.
143-THALLIUM				
002	02.40	2.38	1.67- 3.09	Accept.
226-BORON				
002	0953.	929	876- 1030	Accept.
236-MANGANESE				
001	047.8	48.1	43- 51.4	Accept.
237-MOLYBDENUM				
002	053.1	54.0	42.6- 65.4	Accept.
239-ZINC				
001	0588.	600	536- 652	Accept.
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:				
009-NITRATE AS N				
001	08.45	8.30	7.47- 9.13	Accept.
092-NITRITE AS N				
001	0.493	0.502	0.427-0.577	Accept.
261-ORTHOPHOSPHATE AS P				
001	01.11	1.10	0.957- 1.21	Accept.
INSECTICIDES IN MICROGRAMS PER LITER:				
011-ENDRIN				
001	0.301	0.231	0.162- 0.3	Not Accept.

Report: PE005
Performance Evaluation Report — Page: ?
USEPA Water Supply Study WS037 — Date: 06SEP96

Participant ID: PA00009 Type: OTHER Requesting Office: UT

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
012-LINDANE	001	0.353	0.381	0.21-0.552	Accept.
013-METHOXYCHLOR	001	015.5	18.5	10.2- 26.8	Accept.
014-TOXAPHENE	002	07.04	8.81	4.85- 12.8	Accept.
093-ALACHLOR	005	05.36	4.87	2.68- 7.06	Accept.
094-ATRAZINE	005	07.30	6.80	3.74- 9.86	Accept.
095-HEPTACHLOR	004	0.367	0.563	0.31-0.816	Accept.
096-HEPTACHLOR EPOXIDE	004	0.406	0.403	0.222-0.584	Accept.
097-CHLORDANE (TOTAL)	003	02.39	4.44	2.44- 6.44	Not Accept.
113-SIMAZINE	005	06.30	5.56	1.04- 9.77	Accept.
172-HEXACHLOROBENZENE	004	0.618	0.806	0.323- 1.14	Accept.
241-METOLACHLOR	006	021.7	19.4	7.87- 29.5	Accept.
242-METRIBUZIN	006	014.9	14.1	0.L. - 22.4	Accept.
243-PROMETON	006	023.0	18.8	6.48- 28.3	Accept.
256-ALDRIN	004	0.433	0.567	0.186-0.725	Accept.
257-BUTACHLOR	006	022.3	20.5	5.93- 31.3	Accept.
258-DIELDRIN	004	0.554	0.530	0.358-0.708	Accept.
259-PROPACHLOR	004	01.16	1.20	0.566- 1.86	Accept.
CARBAMATES IN MICROGRAMS PER LITER:					
098-ALDICARB	001	036.4	34.3	24.3- 44.4	Accept.
099-ALDICARB SULFONE	001	034.1	32.3	28.7- 40.1	Accept.
100-ALDICARB SULFOXIDE	001	027.6	25.9	20.3- 33	Accept.
101-CARBOFURAN	001	042.4	48.9	26.9- 70.9	Accept.
114-OXAMYL (VYDATE)	001	044.0	46.4	36.3- 54.9	Accept.

Report: TE005
Performance Evaluation Report — Page: 1
USEPA Water Supply Study WS037 — Date: 06SEP96

Participant ID: PA00009 Type: OTHER Requesting Office: CI

Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
245-METHOMYL				
001	060.0	60.7	49.4- 68.4	Accept.
HERBICIDES IN MICROGRAMS PER LITER:				
015-2,4-D				
001	013.0	14.9	7.45- 22.4	Accept.
016-2,4,5-TP (SILVEX)				
001	09.53	11.8	5.9- 17.7	Accept.
102-PENTACHLOROPHENOL				
001	05.07	6.59	3.3- 9.89	Accept.
115-DALAPON				
002	047.1	56.4	D.L. - 94.8	Accept.
116-DINOSEB				
002	014.2	18.6	0.652- 29.6	Accept.
117-PICLORAM				
002	017.9	23.3	D.L. - 34.8	Accept.
247-DICAMBA				
002	031.5	38.4	2.98- 58.7	Accept.
POLYCHLORINATED BIPHENYLS IN MICROGRAMS PER LITER:				
118-DECACHLOROBIPHENYL				
001	0.305	0.527	D.L. - 1.05	Accept.
PAH'S IN MICROGRAMS PER LITER:				
122-BENZO(A)PYRENE				
C01	0.754	0.937	0.115- 1.31	Accept.
ADIPATE/PHTHALATES IN MICROGRAMS PER LITER:				
134-DI (2-ETHYLHEXYL)ADIPATE				
C01	026.7	34.3	11.4- 52.3	Accept.
136-DI (2-ETHYLHEXYL)PHTHAL.				
001	016.6	21.3	6.98- 34.5	Accept.
MISCELLANEOUS SOC'S IN MICROGRAMS PER LITER:				
137-DIQUAT				
C01	03.43	8.41	2.05- 22.4	Accept.
138-ENDOTHALL				
001	098.6	179	12- 312	Accept.
139-GLYPHOSATE				
001	0729.	780	630- 903	Accept.
TRIHALOMETHANES IN MICROGRAMS PER LITER:				
017-CHLOROFORM				
001	024.1	22.3	17.8- 26.8	Accept.
018-BROMOFORM				
001	018.9	18.6	14.9- 22.3	Accept.

Report: PE005
Performance Evaluation Report — Page: 4
USEPA Water Supply Study WS037 — Date: 06SEP96

Participant ID: PA00009 Type: OTHER Requesting Office: UT

Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
019-BROMODICHLOROMETHANE				
001	C12.2	12.7	10.2- 15.2	Accept.
020-CHLORODIBROMOMETHANE				
001	015.3	14.2	11.4- 17	Accept.
021-TOTAL TRIHALOMETHANE				
001	070.5	67.8	54.2- 81.4	Accept.
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:				
032-VINYL CHLORIDE				
001	015.5	14.8	8.88- 20.7	Accept.
034-1,1-DICHLOROETHYLENE				
001	018.3	16.5	13.2- 19.8	Accept.
035-1,2-DICHLOROETHANE				
001	015.9	13.2	10.6- 15.8	Not Accept.
036-1,1,1-TRICHLOROETHANE				
C01	C11.9	10.3	8.24- 12.4	Accept.
037-CARBON TETRACHLORIDE				
001	014.5	12.7	10.2- 15.2	Accept.
038-TRICHLOROETHYLENE				
001	08.20	8.70	5.22- 12.2	Accept.
039-BENZENE				
001	013.0	12.5	10- 15	Accept.
040-TETRACHLOROETHYLENE				
002	010.1	9.60	5.76- 13.4	Accept.
041-1,4-DICHLOROBENZENE				
001	C6.65	7.31	4.39- 10.2	Accept.
042-T 1,2 DICHLOROETHYLENE				
002	C15.0	14.8	11.8- 17.8	Accept.
043-C 1,2 DICHLOROETHYLENE				
002	011.4	9.72	5.83- 13.6	Accept.
044-1,2 DICHLOROPROPANE				
002	015.4	14.2	11.4- 17	Accept.
045-1,2DIBROMO3CHLOROPROPANE				
004	0.274	0.286	0.172- 0.4	Accept.
046-ETHYLENE DIBROMIDE (EDB)				
004	C.151	C.138	0.0828-0.193	Accept.
047-TOLUENE				
002	C5.74	5.70	3.42- 7.98	Accept.
048-ETHYLBENZENE				
002	09.40	9.19	5.51- 12.9	Accept.
049-CHLOROBENZENE				
002	08.42	8.31	4.99- 11.6	Accept.
053-STYRENE				
002	07.60	7.40	4.44- 10.4	Accept.
054-1,2 DICHLOROBENZENE				
002	014.3	14.5	11.6- 17.4	Accept.

Report: [illegible]
Performance Evaluation Report — Page: [illegible]
USEPA Water Supply Study WS017 — Date: [illegible]

Participant ID: PA00009 Type: OTHER Requesting Office: [illegible]

Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
055-DICHLOROMETHANE				
001	09.48	8.41	5.05- 11.8	Accept.
056-1,1-DICHLOROETHANE				
003	C14.8	13.6	11.2- 16.4	Accept.
061-1,1,2-TRICHLOROETHANE				
001	011.8	10.7	8.56- 12.8	Accept.
063-1,1,1,2TETRACHLOROETHANE				
003	C17.0	15.3	12.8- 18	Accept.
064-1,2,3-TRICHLOROPROPANE				
003	C8.32	8.29	5.53- 11	Accept.
076-1,2,4-TRICHLCROBENZENE				
002	014.7	14.3	11.4- 17.2	Accept.
077-1,2,3-TRICHLOROBENZENE				
003	C15.7	16.7	10.6- 21.2	Accept.
081-HEXACHLOROBUTADIENE				
003	011.1	9.50	4.19- 14.4	Accept.
090-TOTAL XYLENES				
002	015.3	12.9	10.3- 15.5	Accept.
152-C 1,3 DICHLOROPROPENE				
003	010.9	12.3	8.22- 14.3	Accept.
153-T 1,3 DICHLCROPRCPENE				
003	016.4	17.5	11- 20.5	Accept.
ORGANIC DISINFECTION BY-PRODUCTS IN MICRCGRAMS PER LITER:				
157-DIBROMOACETIC ACID				
001	0.918	8.50	D.L. - 13.8	Accept.
158-DICHLOROACETIC ACID				
001	02.82	22.7	6.83- 30.3	Not Accept.
160-MCNCBROMOACETIC ACID				
001	02.74	14.4	1.26- 21.4	Accept.
161-MONOCHLOROACETIC ACID				
001	C1.80	12.8	3.43- 21	Not Accept.
162-TRICHLOROACETIC ACID				
001	C3.77	32.3	5.47- 47.9	Not Accept.
250-BROMOCHLOROACETIC ACID				
001	02.36	19.8	3.19- 30.8	Not Accept.
INORGANIC DISINFECTION BY-PRODUCTS IN MICROGRAMS PER LITER:				
193-BROMATE				
002	05.68	4.56	D.L. - 29	Accept.
194-CHLORATE				
001	C92.1	82.1	62.1- 100	Accept.
195-CHLCRITE				
001	0165.	140	86.6- 213	Accept.
260-BROMIDE				
002	0157.	140	113- 169	Accept.

Report: SE005
Page: 6
Date: 05SEP96

Performance Evaluation Report
USEPA Water Supply Study WS037

Participant ID: PA00009 Type: OTHER Requesting Office: UT

Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
MISCELLANEOUS ANALYTES:				
022-RESIDUAL FREE CHLORINE(MILLIGRAMS PER LITER)				
001	02.64	2.20	2.03- 3.07	Accept.
023-TURBIDITY(NTU'S)				
001	01.40	1.54	1.26- 1.98	Accept.
024-TOTAL FILTERABLE RESIDUE(MILLIGRAMS PER LITER)				
001	0254.	264	188- 434	Accept.
025-CALCIUM HARDNESS(MG. CACO3/L)				
001	0147.	144	137- 158	Accept.
026-PH-UNITS				
001	08.94	9.13	8.88- 9.31	Accept.
027-ALKALINITY(MG. CACO3/L)				
001	028.6	27.4	25.7- 31.5	Accept.
029-SODIUM(MILLIGRAMS PER LITER)				
001	012.9	12.6	11.4- 13.7	Accept.
145-SULFATE(MILLIGRAMS PER LITER)				
001	0263.	280	253- 316	Accept.
146-TOTAL CYANIDE(MILLIGRAMS PER LITER)				
001	0.337	0.380	0.285-0.475	Accept.
263-TOC				
001	03.46	2.80	2.49- 3.24	Not Accept.

********** END OF DATA FOR PA00009 **********
NOTE: FOR LIMITS AND TRUE VALUES, ASSUME THREE SIGNIFICANT DIGITS.
********** END OF REPORT FOR PA00009 **********

* Based on gravimetric calculations, or a reference value when necessary.

LANCASTER LABORATORIES
Account # 7176562301
LANCASTER PA GCL

Performance Evaluation Report — Page: 1
USEPA Water Pollution Study WP035 — Date: 16APR96

Participant ID: PACCCC9 — Type: OTHER — Requesting Office: UT

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
TRACE METALS IN MICROGRAMS/LITER					
001-ALUMINUM					
C1	310	321	261- 382	276- 367	Accept.
C2	1170	1566	1270- 1700	1330- 1640	Accept.
002-ARSENIC					
01	192	194	167- 231	175- 223	Accept.
C2	569	571	492- 676	515- 653	Accept.
003-BERYLLIUM					
C1	170	190	165- 209	170- 204	Accept.
C2	526	581	480- 597	495- 583	Accept.
004-CADMIUM					
C1	50.4	52.6	48.5- 60.7	46.5- 58.7	Accept.
02	388	401	345- 450	359- 440	Accept.
005-COBALT					
01	27.2	28.1	22.9- 32.6	24.1- 31.4	Accept.
C2	603	620	557- 686	570- 670	Accept.
006-CHROMIUM					
01	15.8	17.0	13- 20.5	13.9- 19.5	Accept.
C2	850	880	767- 995	790- 958	Accept.
007-COPPER					
C1	83.2	86.7	75.5- 96.9	78.2- 90.2	Accept.
C2	350	370	330- 409	340- 399	Accept.
008-IRON					
01	41.0	30.4	18.8- 42.6	21.8- 39.6	Ck. for Err.
02	457	460	401- 519	451- 509	Accept.
009-MERCURY					
01	3.36	3.10	2.03- 4.07	2.29- 3.81	Accept.
C2	12.8	11.6	8.65- 14.7	9.41- 13.9	Accept.
010-MANGANESE					
01	385	401	369- 441	378- 432	Accept.
C2	865	881	833- 966	850- 951	Accept.
011-NICKEL					
C1	481	496	453- 560	466- 547	Accept.
C2	601	611	557- 690	570- 680	Accept.
012-LEAD					
C1	282	297	259- 330	269- 325	Accept.
C2	385	399	356- 446	367- 435	Accept.
013-SELENIUM					
01	487	522	402- 615	429- 588	Accept.
C2	898	970	750- 1150	804- 1100	Accept.
014-VANADIUM					
01	202	311	186- 230	192- 229	Accept.
C2	706	811	720- 888	745- 867	Accept.
015-ZINC					
C1	71.9	71.9	62.7- 84.9	65.5- 82.2	Accept.
02	1730	1800	1610- 2030	1660- 1980	Accept.

Performance Evaluation Report — Page: 7
USEPA Water Pollution Study WP035 — Date: 16APR96

Participant ID: PACCCC9 — Type: OTHER — Requesting Office: CT

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
016-ANTIMONY					
03	345	370	240- 450	266- 423	Accept.
04	551	570	369- 692	410- 651	Accept.
017-SILVER					
03	176	180	153- 207	160- 200	Accept.
04	337	340	298- 391	310- 380	Accept.
018-THALLIUM					
03	80.0	83.3	63.4- 99.1	67.9- 94.6	Accept.
04	356	365	301- 425	317- 410	Accept.
074-MOLYBDENUM					
03	126	130	100- 151	112- 140	Accept.
04	309	310	257- 350	270- 345	Accept.
075-STRONTIUM					
03	3.5	3.55	2.56- 4.49	2.81- 4.23	Accept.
04	98.0	96.0	79.8- 110	83.9- 106	Accept.
076-TITANIUM					
03	110	115	96.8- 130	101- 126	Accept.
04	272	270	230- 302	239- 293	Accept.
MINERALS IN MILLIGRAMS/LITER (EXCEPT AS NOTED)					
019-PH-UNITS					
03	4.30	4.30	4.22- 4.4	4.25- 4.38	Accept.
04	5.57	5.50	5.46- 5.62	5.48- 5.6	Accept.
020-SPEC. COND.(UMHOS/CM AT 25 C)					
01	907.	916	830- 983	869- 964	Accept.
02	501.	586	536- 627	547- 616	Accept.
021-TDS AT 180 C					
01	509.	553	326- 762	380- 708	Accept.
02	314.	311	226- 398	248- 377	Accept.
022-TOTAL HARDNESS(AS CACO3)					
01	309.	330	302- 358	309- 351	Accept.
02	97.2	101	90.8- 110	93.2- 108	Accept.
023-CALCIUM					
01	105	100	92.6- 120	96.2- 116	Accept.
02	6.63	6.39	5.53- 7.50	5.79- 7.29	Accept.
024-MAGNESIUM					
01	16.6	17.0	15.2- 19.3	15.7- 18.7	Accept.
02	20.2	20.6	18- 23.6	18.7- 22.9	Accept.
025-SODIUM					
01	14.8	16.2	13.1- 16.2	13.5- 15.8	Accept.
02	52.5	54.3	49.3- 58.9	50.5- 57.7	Accept.
026-POTASSIUM					
01	21.4	21.0	18.8- 23.7	19.4- 23.1	Accept.
02	35.2	38.3	33.3- 41.7	34.3- 40.7	Accept.
027-TOTAL ALKALINITY(AS CACO3)					
01	21.0	20.0	17.4- 25.1	19.3- 24.1	Accept.
02	66.9	72.0	60.8- 78.6	66.5- 76.9	Accept.

Performance Evaluation Report — Page: 3
USEPA Water Pollution Study WP035 — Date: 16AP096

Participant ID: PA00009 — Type: CTHER — Requesting Office: HT

Sample Number	Reported Value	True Value*	Acceptance limits	Warning limits	Performance Evaluation
028-CHLORIDE					
C1	236.	241	224- 259	228- 254	Accept.
02	68.1	72.7	65.1- 79.8	67- 77.9	Accept.
029-FLUORIDE					
C1	3.77	3.50	3.09- 3.8	3.19- 3.71	Ck. for Err.
02	1.39	1.35	1.16- 1.53	1.21- 1.48	Accept.
030-SULFATE					
01	16.9	18.9	13.8- 22.1	14.8- 21.1	Accept.
C2	83.3	86.4	72- 97	75.1- 93.9	Accept.
NUTRIENTS IN MILLIGRAMS/LITER					
031-AMMONIA-NITROGEN					
C1	19.4	19.C	15- 22.3	15.9- 21.5	Accept.
02	1.62	1.40	1.15- 2.08	1.26- 1.97	Accept.
032-NITRATE-NITROGEN					
C1	8.25	8.31	6.76- 9.69	7.11- 9.34	Accept.
02	.340	0.390	0.28-0.495	0.305-0.469	Accept.
033-ORTHOPHOSPHATE					
C1	.054	.0560	0.0333-0.076	0.0384-0.071	Accept.
02	2.88	2.80	2.43- 3.19	2.52- 3.1	Accept.
034-KJELDAHL-NITROGEN					
C3	.632	0.540	0.115- 1.12	0.235-0.995	Accept.
C4	9.30	7.8C	5.73- 9.64	6.2- 9.17	Ck. for Err.
035-TOTAL PHOSPHORUS					
C3	.598	0.574	0.47-0.705	0.498-0.677	Accept.
C4	6.16	6.00	5.1C- 7.2	5.41- 6.96	Accept.
DEMANDS IN MILLIGRAMS/LITER					
036-COD					
01	213.	236	189- 259	198- 250	Accept.
C2	89.4	101	71.2- 120	77.3- 114	Accept.
037-TOC					
C1	91.2	93.1	78.5- 108	82.8- 105	Accept.
02	39.2	40.1	31.6- 47.4	33.6- 45.3	Accept.
038-5-DAY BOD					
C1	152.	141	60.1- 210	83.3- 199	Accept.
02	58.7	62.5	29.5- 95.5	37.7- 87.3	Accept.
102-CARBONACEOUS BOD					
C1	167.	117	38.3- 199	55.6- 179	Accept.
C2	65.4	51.6	20- 83.2	28.2- 75	Accept.
PCB'S IN MICROGRAMS/LITER					
042-PCB-AROCLOR 1232					
C1	2.74	2.76	0.709- 4.3	1.17- 3.84	Accept.
044-PCB-AROCLOR 1260					
C2	4.34	4.26	1.77- 6.04	2.3- 5.5	Accept.

Performance Evaluation Report — Page: 4
USEPA Water Pollution Study WP035 — Date: 12/22/96

Participant ID: PA0CC09 — Type: OTHER — Requesting Office: UT

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
PCB'S IN OIL IN MILLIGRAMS/KILOGRAM					
099-PCB IN OIL- 1016/1242					
C1	31.1	42.3	6.88- 58.9	13.5- 52.3	Accept.
101-PCB IN OIL- 1260					
02	14.0	12.7	3.17- 20.4	5.37- 18.2	Accept.
PESTICIDES IN MICROGRAMS/LITER					
047-ALDRIN					
C1	3.01	3.11	0.522- 5.23	1.12- 4.64	Accept.
02	0.184	0.243	0.065-0.322	0.0977-0.289	Accept.
048-DIELDRIN					
C1	4.38	4.51	2.62- 6.22	3.09- 5.76	Accept.
C2	1.63	1.62	0.859- 2.19	1.03- 2.02	Accept.
049-DDD					
01	6.10	5.67	3.14- 9.33	3.92- 8.55	Accept.
C2	1.87	1.94	1.21- 2.64	1.39- 2.46	Accept.
050-DDE					
01	3.60	3.76	2.14- 5.1	2.51- 4.73	Accept.
C2	1.35	1.42	0.77- 1.85	0.963- 1.71	Accept.
051-DDT					
C1	6.61	6.46	3.79- 9.28	4.48- 8.59	Accept.
02	1.63	1.76	0.865- 2.33	1.05- 2.14	Accept.
052-HEPTACHLOR					
C1	2.41	2.05	0.694- 4.14	1.13- 3.71	Accept.
02	0.232	0.278	0.0899-0.374	0.126-0.338	Accept.
053-CHLORDANE					
C3	12.2	12.1	4.69- 17.2	6.27- 15.6	Accept.
C4	1.31	1.36	0.695- 1.81	0.915- 1.67	Accept.
078-HEPTACHLOR EPOXIDE					
01	1.80	2.20	1.11- 2.53	1.31- 2.35	Accept.
C2	0.230	0.284	0.153- 0.37	0.19-0.342	Accept.
VOLATILE HALOCARBONS IN MICROGRAMS/LITER					
054-1,2 DICHLOROETHANE					
C1	65.9	56.3	39- 78.4	44.1- 74.4	Accept.
02	13.4	12.2	8.5- 17.5	9.63- 16.4	Accept.
055-CHLOROFORM					
C1	70.6	64.8	47.6- 83.2	52.1- 78.7	Accept.
02	13.4	14.2	11- 18.4	11.9- 17.4	Accept.
056-1,1,1 TRICHLOROETHANE					
01	63.1	63.7	41- 85.7	46.6- 80.1	Accept.
C2	17.1	16.2	10.4- 22.2	11.9- 20.7	Accept.
057-TRICHLOROETHENE					
C1	78.6	72.3	55.3- 93	61.6- 87.1	Accept.
C2	16.3	16.1	10.7- 20.6	11.9- 19.4	Accept.
058-CARBONTETRACHLORIDE					
C1	29.7	29.0	16.5- 45	20- 41.4	Accept.
02	10.4	9.16	5.61- 13.7	6.62- 12.7	Accept.

Performance Evaluation Report — Page: 5
USEPA Water Pollution Study WP035 — Date: 16APR96

Participant ID: PA0CCC9 — Type: CTDEF — Requesting Office: DT

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
C59-TETRACHLOROETHENE					
C1	78.9	73.6	66.5- 96.3	52.7- 99.1	Accept.
C2	10.9	10.4	6.04- 14.5	7.1- 13.4	Accept.
C60-BROMODICHLOROETHANE					
C1	60.2	55.6	37- 73.1	41.6- 68.6	Accept.
C2	14.3	14.6	10.7- 19.4	11.7- 17.3	Accept.
C61-DIBROMOCHLOROMETHANE					
C1	51.0	48.5	33.1- 63.4	37- 59.6	Accept.
C2	13.7	14.6	9.59- 19.9	10.7- 17.7	Accept.
C62-BROMOFORM					
C1	60.6	60.0	50.4- 95.3	56- 89.7	Accept.
C2	13.3	12.6	9.02- 17.3	9.53- 16.2	Accept.
C63-METHYLENE CHLORIDE					
C1	52.9	46.7	30.3- 64.1	34.6- 59.8	Accept.
C2	10.6	10.3	6.63- 14.7	7.65- 13.7	Accept.
C64-CHLOROBENZENE					
C1	76.8	68.1	46.5- 89	51.8- 83.7	Accept.
C2	17.8	17.7	11.7- 24.2	13.2- 22.6	Accept.
VOLATILE AROMATICS IN MICROGRAMS/LITER					
C65-BENZENE					
C1	56.0	55.9	40.7- 69.9	44.4- 66.2	Accept.
C2	9.25	9.30	6.50- 12.3	7.29- 11.4	Accept.
C66-ETHYLBENZENE					
C1	57.4	56.4	38.7- 73.3	43- 69	Accept.
C2	10.4	10.4	7.18- 13.6	7.99- 12.9	Accept.
C67-TOLUENE					
C1	44.6	44.7	30.9- 57.6	34.3- 54.2	Accept.
C2	7.48	7.60	5.29- 9.97	5.89- 9.38	Accept.
C94-1,2-DICHLOROBENZENE					
C1	49.3	52.0	40.7- 66.5	44- 63.2	Accept.
C2	11.0	11.7	7.82- 16.6	8.92- 15.5	Accept.
C95-1,4-DICHLOROBENZENE					
C1	47.0	48.3	33.3- 62.2	37- 58.5	Accept.
C2	13.1	13.4	9.37- 17.6	10.4- 16.6	Accept.
C96-1,3-DICHLOROBENZENE					
C1	37.1	42.7	30.4- 53.1	36.7- 50.7	Accept.
C2	11.1	12.6	8.8- 16.6	9.79- 15.6	Accept.
MISCELLANEOUS PARAMETERS					
C71-TOTAL CYANIDE(IN MG/L)					
C1	.022	.0301	0.0138-0.046	0.0179-0.042	Accept.
C2	.006	0.010	0.397-0.522	0.325-0.493	Accept.
C72-NON-FILTERABLE RESIDUE(IN MG/L)					
C1	68.6	86.0	61.9- 98.1	66.4- 93.6	Ck. for Err.
C2	46.0	56.0	43.7- 68.1	48.9- 57.9	Accept.
C73-OIL AND GREASE(IN MG/L)					
C1	51.6	66.0	39.5- 58.1	33.6- 51	Ck. for Err.
C2	23.5	18.9	13- 23.2	13.4- 21.8	Accept.

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USEPA Water Pollution Study WP035 — Date: 16APR96

Participant ID: PACCCC9 — Type: OTHER — Requesting Office: UT

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
097-TOTAL PHENOLICS (IN MG/L)					
C1	1.85	2.71	1.47- 3.96	1.78- 3.68	Accept.
C2	.011	1.19	0.519- 1.87	0.693- 1.7	Accept.
098-TOTAL RESIDUAL CHLORINE (IN MG/L)					
01	3.30	2.80	2.50- 3.6	2.60- 3.46	Accept.
C2	.32C	C.41C	C.295-C.C2A	C.330-C.5E1	Ck. for Err.

********** END OF DATA FOR PACCCC9 **********
NOTE: FOR LIMITS AND TRUE VALUES, ASSUME THREE SIGNIFICANT DIGITS.
********** END OF REPORT FOR PA00009 **********

* Based on gravimetric calculations, or a reference value when necessary.

ORGANIC PREAWARD EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT

LABORATORY: Lancaster Laboratories (PA) [LANCA2]

SCORE: 100.0
MATRIX: WATER
DATE: 11/30/94

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	QUAL
TCL VOLATILE						
VINYL CHLORIDE	43	92	35	120	74	
CHLOROFORM	59	77	56	79	72	
CARBON TETRACHLORIDE	76	100	72	110	100	
BROMODICHLOROMETHANE	63	79	61	81	80	S
TRICHLOROETHENE	120	170	120	170	160	
DIBROMOCHLOROMETHANE	83	100	80	100	96	
BENZENE	77	96	75	98	84	
BROMOFORM	87	110	83	120	96	
TOLUENE	61	77	58	79	68	
XYLENES (TOTAL)	96	130	90	140	100	
TCL SEMIVOLATILE						
PHENOL	35	54	32	64	49	
4-METHYLPHENOL	24	40	21	49	28	
ISOPHORONE	24	35	23	36	30	
2,4-DIMETHYLPHENOL	12	37	0	50	9	S
1,2,4-TRICHLOROBENZENE	25	39	23	47	37	
NAPHTHALENE	20	28	19	32	26	
HEXACHLOROCYCLOPENTADIENE	10	64	0	73	18	
2,4,6-TRICHLOROPHENOL	43	62	40	65	55	
4-BROMOPHENYL PHENYL ETHER	33	44	31	45	40	
HEXACHLOROBENZENE	27	36	26	37	33	
FLUORANTHENE	34	45	33	47	46	S
PYRENE	40	59	37	62	44	
DI-N-OCTYL PHTHALATE	37	65	33	69	63	
BENZO(A)PYRENE	15	43	11	58	24	
DIBENZ(A,H)ANTHRACENE	34	58	30	62	44	
TCL PESTICIDES						
BETA-BHC	0.27	0.41	0.25	0.43	0.36	
HEPTACHLOR EPOXIDE	0.39	0.6	0.36	0.62	0.52	
DIELDRIN	0.42	0.65	0.38	0.68	0.54	
4,4'-DDE	0.36	0.61	0.32	0.64	0.51	
ENDRIN KETONE	0.6	1.1	0.53	1.1	0.87	
GAMMA-CHLORDANE	0.35	0.53	0.33	0.56	0.46	

ORGANIC PREAWARD EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT

LABORATORY: Lancaster Laboratories (PA) [LANCA2]

SCORE: 100.0
MATRIX: WATER
DATE: 11/30/94

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC.	QUAL
NON-TCL VOLATILE						
BENZENE,N-PROPYL-					63	
HEXANE					62	
PROPANE,1,2-DIBROMO-3-CHLORO-						NR
NON-TCL SEMIVOLATILE						
BENZYL ALCOHOL					44	
DIBENZOTHIOPHENE					42	
PARATHION					15	
TCL VOLATILE (Contaminants)						
METHYLENE CHLORIDE					2	
TCL SEMIVOLATILE (Contaminants)						
DIETHYLPHTHALATE					2	
TIC SEMIVOLATILE (Contaminants)						
UNKNOWN CHLORINATED COMPOUND					3	

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 0
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0

ORGANIC PREAWARD EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT

LABORATORY: Lancaster Laboratories (PA) [LANCA2]

SCORE: 93.3
MATRIX: SOIL
DATE: 11/30/94

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	QUAL
TCL VOLATILE						
CHLOROETHANE	57	140	44	160	120	
1,2-DICHLOROETHANE	58	81	55	84	66	
1,2-DICHLOROPROPANE	56	80	53	84	72	
TRICHLOROETHENE	81	120	76	120	120	
DIBROMOCHLOROMETHANE	92	150	84	150	110	
BENZENE	74	110	69	110	94	
TETRACHLOROETHENE	76	100	72	110	88	
TOLUENE	53	73	50	76	55	
CHLOROBENZENE	100	140	97	140	130	
XYLENES (TOTAL)	94	130	88	140	90	S
TCL SEMIVOLATILE						
2-METHYLPHENOL	900	2000	740	2600	200	X
NITROBENZENE	970	2100	810	2600	1900	
2-METHYLNAPHTHALENE	1200	2300	1100	2900	1800	
2-CHLORONAPHTHALENE	1300	2500	1100	3200	2400	
ACENAPHTHYLENE	1600	2700	1400	3200	2300	
DIBENZOFURAN	1600	2800	1400	3500	2400	
FLUORENE	1500	2500	1400	3000	1800	
PENTACHLOROPHENOL	3000	7600	2300	10000	5900	
PHENANTHRENE	1700	3100	1500	3800	2500	
ANTHRACENE	1700	2800	1500	3400	2100	
CARBAZOLE	1400	2800	1200	3000	2200	
CHRYSENE	1600	2700	1400	2800	2000	
BENZO(B)FLUORANTHENE	1300	2300	1200	2400	2000	
INDENO(1,2,3-CD)PYRENE	1200	2200	1100	2700	1600	
BENZO(G,H,I)PERYLENE	1200	2900	920	3800	1900	
TCL PESTICIDES						
GAMMA-BHC (LINDANE)	8.7	23	6.6	25	18	
HEPTACHLOR	12	26	9.6	28	21	
ALDRIN	6.7	17	5.3	18	12	
ENDRIN	27	59	22	63	46	
ENDOSULFAN II	19	49	15	53	33	
4,4'-DDT	20	51	15	56	38	
METHOXYCHLOR	120	280	96	300	250	

ORGANIC PREAWARD EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT

LABORATORY: Lancaster Laboratories (PA) [LANCA2]

SCORE: 93.3
MATRIX: SOIL
DATE: 11/30/94

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC.	QUAL
NON-TCL VOLATILE						
BENZENE,N-PROPYL-					50	
HEXANE					72	
PROPANE,1,2-DIBROMO-3-CHLORO-						NR
NON-TCL SEMIVOLATILE						
BIPHENYL					5300	
DIPHENYL HYDRAZINE					2000	
PARATHION					1600	
TCL VOLATILE (Contaminants)						
METHYLENE CHLORIDE					3	
ACETONE					52	
2-BUTANONE					10	
TCL SEMIVOLATILE (Contaminants)						
ACENAPHTHENE					100	
BIS(2-ETHYLHEXYL)PHTHALATE					310	
TCL PESTICIDES (Contaminants)						
DELTA-BHC					0.33	
ENDOSULFAN I					0.26	
4,4'-DDE					0.33	
ENDRIN KETONE					2.3	
ENDRIN ALDEHYDE					1.4	
TIC VOLATILE (Contaminants)						
ETHANE,1,1,2-TRICHLORO-1,2,					11	
TIC SEMIVOLATILE (Contaminants)						
9,10-ANTHRACENEDIONE					78	
UNKNOWN					82	
UNKNOWN					75	

ORGANIC PREAWARD EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT

LABORATORY: Lancaster Laboratories (PA) [LANCA2]

SCORE: 93.3
MATRIX: SOIL
DATE: 11/30/94

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	QUAL

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 1
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0

13. Preventive Maintenance

In order to ensure timely production of data, Lancaster Laboratories schedules routine preventive maintenance of instruments based on manufacturer's recommendations. Maintenance of the laboratory instruments is the responsibility of the technical group using the equipment in conjunction with our in-house Equipment Maintenance Group. A schedule of routinely performed instrument maintenance tasks is attached as Table 13-1. All preventive maintenance, as well as maintenance performed as corrective action, is recorded in instrument logs.

Critical spare parts are kept in supply at the laboratory by the Equipment Maintenance Group. Most items not kept in stock at the laboratory are available through overnight delivery from the manufacturer. In addition, Lancaster Labs maintains multiple numbers of most of the critical instruments used in our laboratory operations. A recent equipment inventory may be found in the *Qualification Manual*. Because we are a large laboratory with redundant capacity, the problems of instrument downtime are minimized.

Table 13-1

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
GC/MS	Column maintenance	AN*
	Change septum	Weekly or AN*
	Check fans	Monthly
	Check cool flow	Monthly
	Clean source	Bimonthly or AN
	Change oil in vacuum pump	Semiannually
	Change oil in turbo pump	Semiannually
GC	Septum change	Each run
	Column maintenance	AN
	Clean detector	AN
	Vacuum filters	Semiannually
	Leak check ECDs	Semiannually
Flame AA	Rinse burner head, chamber and trap	AN: Min. Weekly
	Clean nebulizer	Weekly
	Inspect tubing and O-rings	Monthly
	Replace lamp	AN
GFAA	Rinse workhead assembly	Weekly
	Clean windows	Weekly
	Replace probe tubing	AN
	Check rinse bottle & drain	Daily
ICP	Clean torch	AN
	Clean nebulizer & spray chamber	AN
	Replace pump winding	Check Daily
	Lubricate autosampler	Check Daily
	Check mirror	Check Daily
	Check tubing to torch	Daily
	Check fan filters, clean if needed	Weekly
	Check cool flow, clean if needed	Weekly
	Check water filter, replace if needed	Quarterly
Cold Vapor AA	Change drying tube	Daily
	Replace pump tubing	AN: Min. weekly
	Lubricate pump head	Weekly
	Lubricate autosampler	Weekly
	Inspect optical cell and windows	Monthly
	Clean	AN
Autoanalyzer	Clean sample probe	AN
	Clean proportioning pump	Weekly
	Inspect pump tubing, replace if worn	AN
	Clean wash receptacles	Monthly
	Inspect condition of distillation head	Monthly

*AN means as needed. Any of these items may be performed more frequently if response during operation indicates this is necessary.

14. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

Precision - Precision refers to the reproducibility of a method when it is repeated on a second aliquot of the same sample. The degree of agreement is expressed as the relative percent difference (RPD). The RPD will be calculated according to the following equation:

$$RPD = \frac{D_2 - D_1}{(D_1 + D_2)/2} \times 100$$

Where:

D_1 = First sample value

D_2 = Second sample value (Duplicate)

Duplicates will be run on at least 5% of the samples. Acceptance criteria shall be within the value range specified by EPA in the CLP SOW. (See Section No. 11.) All quality control sample results are entered into the computer and compared with acceptance limits. In addition, there is a monthly review of values on the computer QC system. Data obtained from quality control samples is entered onto our computer system which charts the data and calculates a mean and standard deviation on a monthly basis. The Quality Assurance Department then reviews this data for trends which may indicate analytical problems. The control charts are graphical methods for monitoring precision and bias over time.

Accuracy - Accuracy refers to the agreement between the amount of a compound measured by the test method and the amount actually present. Accuracy is usually expressed as a percent recovery (R). Recoveries will be calculated according to the following equations:

$$Surrogate\ \text{Re}\,cov\,ery = \frac{Qd}{Qa} \times 100$$

Where:

Qd = Quantity determined by analysis

Qa = Quantity added to sample

$$Matrix\ Spike\ \text{Re}\,cov\,ery = \frac{SSR - SR}{SA} \times 100$$

Where:

SSR = Spiked sample results

SR = Sample results

SA = Spike added

$$Laboratory\ Control\ Sample\ \text{Re}\,cov\,ery = \frac{LCS\ Found}{LCS\ True} \times 100$$

Surrogate standards are added to each sample analyzed for organics. Spikes and laboratory control samples will be run on at least 5% of the samples (each batch or SDG, ≤20 samples). Acceptance criteria for the accuracy recoveries shall be within the range specified by EPA in the CLP SOW. (See Section No. 11.) The Laboratory computer is programmed to compare the individual values with the acceptance limits and inform the analyst if the results meet specification. If the results are not within the acceptance criteria, corrective action suitable to the situation will be taken. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with documentation of any QC problems in the case narrative.

Commercial quality control materials are run at least quarterly to ensure accuracy of the analytical procedure. Repetitive analysis of a reference material will also yield precision data. Accuracy information determined from reference materials is valuable because variables specific to sample matrix are eliminated.

The QC program is capable of charting data for surrogates, spikes, control materials, and reference materials. The Quality Assurance Department reviews these charts for any indication of possible problems (i.e., shift in the mean and standard deviation).

Completeness - Completeness is the percentage of valid data acquired from a measurement system compared to the amount of valid measurements that were planned to be collected. The objective is analysis of all samples submitted intact, and to ensure that sufficient sample weight/volume is available should the initial analysis not meet acceptance criteria. The laboratory's sample management system will assign a unique identification number to the sample which tracks and controls movement of samples from the time of receipt until disposal. All data generated will be recorded referencing the corresponding sample identification number. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. This information will include, but is not limited to, summaries of QC data and sample results, chromatograms, spectra, and instrument tune and calibration data. Additional information will be stored in the laboratory's archives, both hard copy and magnetic tape.

$$Completeness = \frac{Number\ of\ valid\ measurements}{Total\ measurements\ needed} \times 100$$

15. Corrective Action

Whenever any of the data generated falls outside of the established acceptance criteria outlined for instrument tune and calibration (Section 8) and internal QC (Section 11), the cause of this irregularity must be investigated, corrected, and documented. The documentation will be used to prevent a recurrence of the problem and to inform management of the situation.

If the results are not within acceptance criteria, the appropriate corrective action will be initiated. This may include, but is not limited to, checking calculation and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with a comment stating the observed deviation.

A standard operating procedure is in place which outlines the procedures to be followed when quality control data for an analysis falls outside of previously established acceptance limits. All QC data must be entered onto the computerized QC system promptly after its generation and daily "out-of-spec" data is reported via this system. Any data outside the acceptance criteria will be reviewed by the Quality Assurance Department. Where appropriate, the Quality Assurance Department will place outliers in one of three categories:

A. Marginal Outlier - Data that are outside the 95% confidence interval but within the 99% confidence interval. This category may also be used for QC samples subject to matrix interferences or sample inhomogeneity.

B. Outlier - Data outside the 99% confidence interval and/or observable trends such as a shift in mean and standard deviation.

C. Extreme Outlier - Such data would indicate the system is out of control and no results should be reported to clients; an example would be more than one reference or control falling outside the 99% confidence interval.

The daily out-of-spec reports are then distributed to group leaders or their QC coordinator who will check all supporting data and document their findings and any corrective action taken. Documentation of QC data will be filed in the departmental QC notebook. In the case of outliers or extreme outliers, the Quality

Assurance Department may issue a formal request for investigation and corrective action (see sample form that follows). The Quality Assurance Department is responsible for initiating the corrective actions, insuring that the actions are taken in a timely manner, and that the desired results are produced. The QA Department will circulate all completed Investigation & Corrective Action forms to the appropriate manager.

The Quality Assurance Department is also responsible for conducting periodic audits which ensure compliance with laboratory SOPs and assist in identifying and correcting any deficiencies. These audits may entail observation as procedures are carried out or a review of records to demonstrate traceability and compliance with all documented record keeping procedures. The QA Department will issue a audit written report which summarizes the audit findings and the technical centers are then requested to respond in writing within 30 days of report receipt. The response will address the corrective action that needs to be taken along with an expected completion date. Audit results and the corresponding response are communicated to laboratory personnel and management. Follow-up audits verify that proper corrective action has been taken for the identified discrepancy.

Lancaster Laboratories
2425 New Holland Pike • Lancaster PA 17601-5994

No. _____

Investigation and Corrective Action Report

Part I Description of problem

1. Date
2. LLI sample number(s) involved
3. Nature of problem (e.g., QA outlier, procedural deviation, client complaint, etc.)

4. _____ Check if investigation must be complete before reporting further data to clients

Initiated by: _____

Part II (Attach separate sheet if needed)

1. Steps taken to investigate problem.

2. Explanation of probable cause of problem.

3. Steps taken to prevent future occurrence.

4. Besides the sample(s) listed above, would data sent to any clients be affected by this problem? If yes, explain.

5. Signed: _____ Date: _____

Return by: _____

16. Quality Assurance Reports to Management

Reports of quality status from the Quality Assurance Department to management are made frequently and in various forms. All results from internal or external performance evaluation samples are circulated to management. A report of each audit performed is prepared and copied to management. Monthly summaries of data obtained from analysis of quality control check samples are generated via the computerized sample management system. These summaries include mean and standard deviation to aid in assessment of data accuracy and precision. Forms summarizing problems which require investigation and corrective action are completed by group leaders and circulated to management. Through these channels, laboratory management is kept apprised of QA/QC activities.

Any problems or unusual observations that occur during the analysis of samples for a specific project will be listed on the laboratory report and/or in the case narrative delivered with the data package. The items often discussed in this manner include samples with surrogate recovery outside of the acceptance criteria and samples with matrix problems requiring dilution and causing increased detection limits. Where applicable, any corrective action attempted or performed to address the problem will also be presented.

The laboratory will contact the client for direction regarding major problems such as samples listed on the chain of custody but missing from the shipping container, samples which arrive broken or are accidentally broken in the laboratory, and samples with severe matrix problems. The client will be contacted if it is necessary to change any item in the original project plan.

Appendix A

CLP Forms
Inorganics and Organics

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water)_____ Lab Sample ID: _____

Sample wt/vol: _____(g/mL)____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec._____ Date Analyzed: _____

GC Column: _____ ID: _____(mm) Dilution Factor: _____

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)_____	Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water)_____ Lab Sample ID: _____

Sample wt/vol: _____(g/mL)____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: _____ decanted: (Y/N)___ Date Extracted:_____

Concentrated Extract Volume: _____(uL) Date Analyzed: _____

Injection Volume: _____(uL) Dilution Factor: _____

GPC Cleanup: (Y/N)___ pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)_____	Q
108-95-2	Phenol		
111-44-4	bis(2-Chloroethyl)ether		
95-57-8	2-Chlorophenol		
541-73-1	1,3-Dichlorobenzene		
106-46-7	1,4-Dichlorobenzene		
95-50-1	1,2-Dichlorobenzene		
95-48-7	2-Methylphenol		
108-60-1	2,2'-oxybis(1-Chloropropane)		
106-44-5	4-Methylphenol		
621-64-7	N-Nitroso-di-n-propylamine		
67-72-1	Hexachloroethane		
98-95-3	Nitrobenzene		
78-59-1	Isophorone		
88-75-5	2-Nitrophenol		
105-67-9	2,4-Dimethylphenol		
111-91-1	bis(2-Chloroethoxy)methane		
120-83-2	2,4-Dichlorophenol		
120-82-1	1,2,4-Trichlorobenzene		
91-20-3	Naphthalene		
106-47-8	4-Chloroaniline		
87-68-3	Hexachlorobutadiene		
59-50-7	4-Chloro-3-methylphenol		
91-57-6	2-Methylnaphthalene		
77-47-4	Hexachlorocyclopentadiene		
88-06-2	2,4,6-Trichlorophenol		
95-95-4	2,4,5-Trichlorophenol		
91-58-7	2-Chloronaphthalene		
88-74-4	2-Nitroaniline		
131-11-3	Dimethylphthalate		
208-96-8	Acenaphthylene		
606-20-2	2,6-Dinitrotoluene		
99-09-2	3-Nitroaniline		
83-32-9	Acenaphthene		

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water)_____ Lab Sample ID: _____

Sample wt/vol: _____(g/mL)____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: _____ decanted: (Y/N)___ Date Extracted:_____

Concentrated Extract Volume: _____(uL) Date Analyzed: _____

Injection Volume: _____(uL) Dilution Factor: _____

GPC Cleanup: (Y/N)___ pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)_____	Q
51-28-5	2,4-Dinitrophenol		
100-02-7	4-Nitrophenol		
132-64-9	Dibenzofuran		
121-14-2	2,4-Dinitrotoluene		
84-66-2	Diethylphthalate		
7005-72-3	4-Chlorophenyl-phenylether		
86-73-7	Fluorene		
100-01-6	4-Nitroaniline		
534-52-1	4,6-Dinitro-2-methylphenol		
86-30-6	N-Nitrosodiphenylamine (1)		
101-55-3	4-Bromophenyl-phenylether		
118-74-1	Hexachlorobenzene		
87-86-5	Pentachlorophenol		
85-01-8	Phenanthrene		
120-12-7	Anthracene		
86-74-8	Carbazole		
84-74-2	Di-n-butylphthalate		
206-44-0	Fluoranthene		
129-00-0	Pyrene		
85-68-7	Butylbenzylphthalate		
91-94-1	3,3'-Dichlorobenzidine		
56-55-3	Benzo(a)anthracene		
218-01-9	Chrysene		
117-81-7	bis(2-Ethylhexyl)phthalate		
117-84-0	Di-n-octylphthalate		
205-99-2	Benzo(b)fluoranthene		
207-08-9	Benzo(k)fluoranthene		
50-32-8	Benzo(a)pyrene		
193-39-5	Indeno(1,2,3-cd)pyrene		
53-70-3	Dibenz(a,h)anthracene		
191-24-2	Benzo(g,h,i)perylene		

(1) - Cannot be separated from Diphenylamine

EPA SAMPLE NO.

PESTICIDE ORGANICS ANALYSIS DATA SHEET

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water)_____ Lab Sample ID: _____

Sample wt/vol: _____(g/mL)____ Lab File ID: _____

% Moisture: _____ decanted: (Y/N)___ Date Received: _____

Extraction: (SepF/Cont/Sonc) _____ Date Extracted:_____

Concentrated Extract Volume: _____(uL) Date Analyzed: _____

Injection Volume: _____(uL) Dilution Factor: _____

GPC Cleanup: (Y/N)___ pH:____ Sulfur Cleanup: (Y/N) ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)_____	Q
319-84-6	alpha-BHC		
319-85-7	beta-BHC		
319-86-8	delta-BHC		
58-89-9	gamma-BHC (Lindane)		
76-44-8	Heptachlor		
309-00-2	Aldrin		
1024-57-3	Heptachlor epoxide		
959-98-8	Endosulfan I		
60-57-1	Dieldrin		
72-55-9	4,4'-DDE		
72-20-8	Endrin		
33213-65-9	Endosulfan II		
72-54-8	4,4'-DDD		
1031-07-8	Endosulfan sulfate		
50-29-3	4,4'-DDT		
72-43-5	Methoxychlor		
53494-70-5	Endrin ketone		
7421-93-4	Endrin aldehyde		
5103-71-9	alpha-Chlordane		
5103-74-2	gamma-Chlordane		
8001-35-2	Toxaphene		
12674-11-2	Aroclor-1016		
11104-28-2	Aroclor-1221		
11141-16-5	Aroclor-1232		
53469-21-9	Aroclor-1242		
12672-29-6	Aroclor-1248		
11097-69-1	Aroclor-1254		
11096-82-5	Aroclor-1260		

1E

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water)_____ Lab Sample ID: _____

Sample wt/vol: _____(g/mL)____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec._____ Date Analyzed: _____

GC Column: _____ ID: _____(mm) Dilution Factor: _____

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: _____ CONCENTRATION UNITS: (ug/L or ug/Kg)_____

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
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26.					
27.					
28.					
29.					
30.					

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water)_____ Lab Sample ID: _____

Sample wt/vol: _____(g/mL)____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: _____ decanted: (Y/N)___ Date Extracted:_____

Concentrated Extract Volume: _____(uL) Date Analyzed: _____

Injection Volume: _____(uL) Dilution Factor: _____

GPC Cleanup: (Y/N)___ pH:____

Number TICs found: _____ CONCENTRATION UNITS: (ug/L or ug/Kg)_____

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
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28.					
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30.					

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	SMC1 (TOL)#	SMC2 (BFB)#	SMC3 (DCE)#	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
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26						
27						
28						
29						
30						

	QC LIMITS
SMC1 (TOL) = Toluene-d8	(88-110)
SMC2 (BFB) = Bromofluorobenzene	(86-115)
SMC3 (DCE) = 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

2B

SOIL VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level:(low/med) _____

	EPA SAMPLE NO.	SMC1 (TOL)#	SMC2 (BFB)#	SMC3 (DCE)#	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
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16						
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28						
29						
30						

	QC LIMITS
SMC1 (TOL) = Toluene-d8	(84-138)
SMC2 (BFB) = Bromofluorobenzene	(59-113)
SMC3 (DCE) = 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

page __ of __

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	S1 (NBZ)#	S2 (FBP)#	S3 (TPH)#	S4 (PHL)#	S5 (2FP)#	S6 (TBP)#	S7 (2CP)#	S8 (DCB)#	TOT OUT
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
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23										
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25										
26										
27										
28										
29										
30										

		QC LIMITS	
S1 (NBZ)	= Nitrobenzene-d5	(35-114)	
S2 (FBP)	= 2-Fluorobiphenyl	(43-116)	
S3 (TPH)	= Terphenyl-d14	(33-141)	
S4 (PHL)	= Phenol-d5	(10-110)	
S5 (2FP)	= 2-Fluorophenol	(21-110)	
S6 (TBP)	= 2,4,6-Tribromophenol	(10-123)	
S7 (2CP)	= 2-Chlorophenol-d4	(33-110)	(advisory)
S8 (DCB)	= 1,2-Dichlorobenzene-d4	(16-110)	(advisory)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogate diluted out

SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level:(low/med)_____

	EPA SAMPLE NO.	S1 (NBZ)#	S2 (FBP)#	S3 (TPH)#	S4 (PHL)#	S5 (2FP)#	S6 (TBP)#	S7 (2CP)#	S8 (DCB)#	TOT OUT
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
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23										
24										
25										
26										
27										
28										
29										
30										

		QC LIMITS	
S1 (NBZ)	= Nitrobenzene-d5	(23-120)	
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)	
S3 (TPH)	= Terphenyl-d14	(18-137)	
S4 (PHL)	= Phenol-d5	(24-113)	
S5 (2FP)	= 2-Fluorophenol	(25-121)	
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)	
S7 (2CP)	= 2-Chlorophenol-d4	(20-130)	(advisory)
S8 (DCB)	= 1,2-Dichlorobenzene-d4	(20-130)	(advisory)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

2E

WATER PESTICIDE SURROGATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.:_____

GC Column(1): _____ ID: _____(mm) GC Column(2): _____ ID: _____(mm)

	EPA SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

QC LIMITS

TCX = Tetrachloro-m-xylene (30-150)
DCB = Decachlorobiphenyl (30-150)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

page __ of __

2F

SOIL PESTICIDE SURROGATE RECOVERY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column(1): _____ ID: _____(mm) GC Column(2): _____ ID: _____(mm)

	EPA SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

QC LIMITS

TCX = Tetrachloro-m-xylene (30-150)
DCB = Decachlorobiphenyl (30-150)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

page __ of __

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD:_____ out of _____ outside limits
Spike Recovery:_____ out of _____ outside limits

COMMENTS: _____
_____

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene					59-172
Trichloroethene					62-137
Benzene					66-142
Toluene					59-139
Chlorobenzene					60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					22	59-172
Trichloroethene					24	62-137
Benzene					21	66-142
Toluene					21	59-139
Chlorobenzene					21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD:_____ out of _____ outside limits
Spike Recovery:_____ out of _____ outside limits

COMMENTS: _____

_____

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
Phenol					12-110
2-Chlorophenol					27-123
1,4-Dichlorobenzene					36- 97
N-Nitroso-di-n-prop.(1)					41-116
1,2,4-Trichlorobenzene					39- 98
4-Chloro-3-methylphenol					23- 97
Acenaphthene					46-118
4-Nitrophenol					10- 80
2,4-Dinitrotoluene					24- 96
Pentachlorophenol					9-103
Pyrene					26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					42	12-110
2-Chlorophenol					40	27-123
1,4-Dichlorobenzene					28	36- 97
N-Nitroso-di-n-prop.(1)					38	41-116
1,2,4-Trichlorobenzene					28	39- 98
4-Chloro-3-methylphenol					42	23- 97
Acenaphthene					31	46-118
4-Nitrophenol					50	10- 80
2,4-Dinitrotoluene					38	24- 96
Pentachlorophenol					50	9-103
Pyrene					31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD:_____ out of _____ outside limits
Spike Recovery:_____ out of _____ outside limits

COMMENTS: _____

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
Phenol					26- 90
2-Chlorophenol					25-102
1,4-Dichlorobenzene					28-104
N-Nitroso-di-n-prop.(1)					41-126
1,2,4-Trichlorobenzene					38-107
4-Chloro-3-methylphenol					26-103
Acenaphthene					31-137
4-Nitrophenol					11-114
2,4-Dinitrotoluene					28- 89
Pentachlorophenol					17-109
Pyrene					35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					35	26- 90
2-Chlorophenol					50	25-102
1,4-Dichlorobenzene					27	28-104
N-Nitroso-di-n-prop.(1)					38	41-126
1,2,4-Trichlorobenzene					23	38-107
4-Chloro-3-methylphenol					33	26-103
Acenaphthene					19	31-137
4-Nitrophenol					50	11-114
2,4-Dinitrotoluene					47	28- 89
Pentachlorophenol					47	17-109
Pyrene					36	35-142

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD:_____ out of _____ outside limits
Spike Recovery:_____ out of _____ outside limits

COMMENTS: _____

_____

WATER PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
gamma-BHC (Lindane)					56-123
Heptachlor					40-131
Aldrin					40-120
Dieldrin					52-126
Endrin					56-121
4,4'-DDT					38-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)					15	56-123
Heptachlor					20	40-131
Aldrin					22	40-120
Dieldrin					18	52-126
Endrin					21	56-121
4,4'-DDT					27	38-127

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD:_____ out of _____ outside limits
Spike Recovery:_____ out of _____ outside limits

COMMENTS: _____

SOIL PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
gamma-BHC (Lindane)____	_____	_____	_____	_____	46-127
Heptachlor_____	_____	_____	_____	_____	35-130
Aldrin_____	_____	_____	_____	_____	34-132
Dieldrin_____	_____	_____	_____	_____	31-134
Endrin_____	_____	_____	_____	_____	42-139
4,4'-DDT_____	_____	_____	_____	_____	23-134
_____	_____	_____	_____	_____	_____

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)____	_____	_____	_____	_____	50	46-127
Heptachlor_____	_____	_____	_____	_____	31	35-130
Aldrin_____	_____	_____	_____	_____	43	34-132
Dieldrin_____	_____	_____	_____	_____	38	31-134
Endrin_____	_____	_____	_____	_____	45	42-139
4,4'-DDT_____	_____	_____	_____	_____	50	23-134
_____	_____	_____	_____	_____	_____	_____

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD:_____ out of _____ outside limits
Spike Recovery:_____ out of _____ outside limits

COMMENTS: _____
_____

4A

EPA SAMPLE NO.

VOLATILE METHOD BLANK SUMMARY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ Lab Sample ID: _____

Date Analyzed: _____ Time Analyzed: _____

GC Column: _____ ID: _____(mm) Heated Purge: (Y/N) ___

Instrument ID: _____

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS: _____

_____

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ Lab Sample ID: _____

Instrument ID: _____ Date Extracted: _____

Matrix: (soil/water) _____ Date Analyzed: _____

Level: (low/med) _____ Time Analyzed: _____

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
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21				
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25				
26				
27				
28				
29				
30				

COMMENTS: _____

4C

PESTICIDE METHOD BLANK SUMMARY

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab Sample ID: _____ Lab File ID: _____

Matrix: (soil/water) _____ Extraction: (SepF/Cont/Sonc) _____

Sulfur Cleanup: (Y/N) __ Date Extracted: _____

Date Analyzed (1): _____ Date Analyzed (2): _____

Time Analyzed (1): _____ Time Analyzed (2): _____

Instrument ID (1): _____ Instrument ID (2): _____

GC Column (1): _____ ID: _____ (mm) GC Column (2): _____ ID: _____ (mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

COMMENTS: _____

_____

page __ of __

5A

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ BFB Injection Date:_____

Instrument ID: _____ BFB Injection Time:_____

GC Column: _____ ID: _____(mm) Heated Purge: (Y/N) ___

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	8.0 - 40.0% of mass 95	
75	30.0 - 66.0% of mass 95	
95	Base peak, 100% relative abundance	
96	5.0 - 9.0% of mass 95	
173	Less than 2.0% of mass 174	( )1
174	50.0 - 120.0% of mass 95	
175	4.0 - 9.0 % of mass 174	( )1
176	93.0 - 101.0% of mass 174	( )1
177	5.0 - 9.0% of mass 176	( )2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ DFTPP Injection Date: _____

Instrument ID: _____ DFTPP Injection Time: _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	
68	Less than 2.0% of mass 69	( )1
69	Mass 69 relative abundance	
70	Less than 2.0% of mass 69	( )1
127	25.0 - 75.0% of mass 198	
197	Less than 1.0% of mass 198	
198	Base Peak, 100% relative abundance	
199	5.0 to 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	Greater than 0.75% of mass 198	
441	Present, but less than mass 443	
442	40.0 - 110.0% of mass 198	
443	15.0 - 24.0% of mass 442	( )2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date(s):_____ _____

Heated Purge: (Y/N) ___ Calibration Times: _____ _____

GC Column: _____ ID: _____(mm)

LAB FILE ID: RRF10 =_____ RRF20 =_____
RRF50 =_____ RRF100=_____ RRF200=_____

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	$\overline{RRF}$	% RSD
Chloromethane							
Bromomethane *							*
Vinyl Chloride *							*
Chloroethane							
Methylene Chloride							
Acetone							
Carbon Disulfide							
1,1-Dichloroethene *							*
1,1-Dichloroethane *							*
1,2-Dichloroethene (total)							
Chloroform *							*
1,2-Dichloroethane *							*
2-Butanone							
1,1,1-Trichloroethane *							*
Carbon Tetrachloride *							*
Bromodichloromethane *							*
1,2-Dichloropropane							
cis-1,3-Dichloropropene *							*
Trichloroethene *							*
Dibromochloromethane *							*
1,1,2-Trichloroethane *							*
Benzene *							*
trans-1,3-Dichloropropene *							*
Bromoform *							*
4-Methyl-2-Pentanone							
2-Hexanone							
Tetrachloroethene *							*
1,1,2,2-Tetrachloroethane *							*
Toluene *							*
Chlorobenzene *							*
Ethylbenzene *							*
Styrene *							*
Xylene (total) *							*
Toluene-d8							
Bromofluorobenzene *							*
1,2-Dichloroethane-d4							

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date(s):_____ _____

Calibration Times: _____ _____

LAB FILE ID: RRF20 =_____ RRF50 =_____
RRF80 =_____ RRF120=_____ RRF160=_____

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
Phenol							
bis(2-Chloroethyl)ether							
2-Chlorophenol							
1,3-Dichlorobenzene							
1,4-Dichlorobenzene							
1,2-Dichlorobenzene							
2-Methylphenol							
2,2'-oxybis(1-Chloropropane)							
4-Methylphenol							
N-Nitroso-di-n-propylamine							
Hexachloroethane							
Nitrobenzene							
Isophorone							
2-Nitrophenol							
2,4-Dimethylphenol							
bis(2-Chloroethoxy)methane							
2,4-Dichlorophenol							
1,2,4-Trichlorobenzene							
Naphthalene							
4-Chloroaniline							
Hexachlorobutadiene							
4-Chloro-3-methylphenol							
2-Methylnaphthalene							
Hexachlorocyclopentadiene							
2,4,6-Trichlorophenol							
2,4,5-Trichlorophenol							
2-Chloronaphthalene							
2-Nitroaniline							
Dimethylphthalate							
Acenaphthylene							
2,6-Dinitrotoluene							
3-Nitroaniline							
Acenaphthene							
2,4-Dinitrophenol							
4-Nitrophenol							
Dibenzofuran							
2,4-Dinitrotoluene							

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date(s):_____ _____

Calibration Times: _____ _____

LAB FILE ID: RRF20 =_____ RRF50 =_____
RRF80 =_____ RRF120=_____ RRF160=_____

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
Diethylphthalate							
4-Chlorophenyl-phenylether	*						*
Fluorene	*						*
4-Nitroaniline							
4,6-Dinitro-2-methylphenol							
N-Nitrosodiphenylamine (1)							
4-Bromophenyl-phenylether	*						*
Hexachlorobenzene	*						*
Pentachlorophenol	*						*
Phenanthrene	*						*
Anthracene	*						*
Carbazole							
Di-n-butylphthalate							
Fluoranthene	*						*
Pyrene	*						*
Butylbenzylphthalate							
3,3'-Dichlorobenzidine							
Benzo(a)anthracene	*						*
Chrysene	*						*
bis(2-Ethylhexyl)phthalate							
Di-n-octylphthalate							
Benzo(b)fluoranthene	*						*
Benzo(k)fluoranthene	*						*
Benzo(a)pyrene	*						*
Indeno(1,2,3-cd)pyrene	*						*
Dibenz(a,h)anthracene	*						*
Benzo(g,h,i)perylene	*						*
Nitrobenzene-d5							*
2-Fluorobiphenyl	*						*
Terphenyl-d14	*						*
Phenol-d5	*						*
2-Fluorophenol	*						*
2,4,6-Tribromophenol							
2-Chlorophenol-d4	*						*
1,2-Dichlorobenzene-d4	*						*

(1) Cannot be separated from Diphenylamine

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

PESTICIDE INITIAL CALIBRATION OF SINGLE COMPONENT ANALYTES

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Level (x low): low _____ mid _____ high _____

GC Column: _____ ID: _____(mm) Date(s) Analyzed: _____ _____

COMPOUND	RT OF STANDARDS LOW	MID	HIGH	MEAN RT	RT WINDOW FROM	TO
alpha-BHC						
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Aldrin						
Heptachlor epoxide						
Endosulfan I						
Dieldrin						
4,4'-DDE						
Endrin						
Endosulfan II						
4,4'-DDD						
Endosulfan sulfate						
4,4'-DDT						
Methoxychlor						
Endrin ketone						
Endrin aldehyde						
alpha-Chlordane						
gamma-Chlordane						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

* Surrogate retention times are measured from Standard Mix A analyses.

Retention time windows are ± 0.05 minutes for all compounds that elute before Heptachlor epoxide, ±0.07 minutes for all other compounds, except ±0.10 minutes for Decachlorobiphenyl.

PESTICIDE INITIAL CALIBRATION OF SINGLE COMPONENT ANALYTES

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Level (x low): low _____ mid _____ high _____

GC Column: _____ ID: _____(mm) Date(s) Analyzed: _____ _____

COMPOUND	CALIBRATION FACTORS LOW	MID	HIGH	MEAN	%RSD
alpha-BHC					
beta-BHC					
delta-BHC					
gamma-BHC (Lindane)					
Heptachlor					
Aldrin					
Heptachlor epoxide					
Endosulfan I					
Dieldrin					
4,4'-DDE					
Endrin					
Endosulfan II					
4,4'-DDD					
Endosulfan sulfate					
4,4'-DDT					
Methoxychlor					
Endrin ketone					
Endrin aldehyde					
alpha-Chlordane					
gamma-Chlordane					
Tetrachloro-m-xylene					
Decachlorobiphenyl					

* Surrogate calibration factors are measured from Standard Mix A analyses.

6F

PESTICIDE INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Date(s) Analyzed: _____ _____

GC Column: _____ ID: _____(mm)

COMPOUND	AMOUNT (ng)	PEAK	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR
Toxaphene		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1016		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1221		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1232		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1242		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1248		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1254		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1260		*1				
		*2				
		*3				
		4				
		5				

* Denotes required peaks

6G

PESTICIDE ANALYTE RESOLUTION SUMMARY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column (1): _____ ID:_____(mm) Instrument ID (1): _____

EPA Sample No. (Standard 1): _____ Lab Sample ID (1): _____

Date Analyzed (1): _____ Time Analyzed (1): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			

GC Column (2): _____ ID:_____(mm) Instrument ID (2): _____

EPA Sample No. (Standard 2): _____ Lab Sample ID (2): _____

Date Analyzed (2): _____ Time Analyzed (2): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			

PERFORMANCE EVALUATION MIXTURE (PEM)

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column (1): _____ ID:_____(mm) Instrument ID (1): _____

EPA Sample No. (Standard 1): _____ Lab Sample ID (1): _____

Date Analyzed (1): _____ Time Analyzed (1): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			

GC Column (2): _____ ID:_____(mm) Instrument ID (2): _____

EPA Sample No. (Standard 2): _____ Lab Sample ID (2): _____

Date Analyzed (2): _____ Time Analyzed (2): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			

INDIVIDUAL STANDARD MIXTURE A

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column (1): _____ ID:_____(mm) Instrument ID (1): _____

EPA Sample No. (Standard 1): _____ Lab Sample ID (1): _____

Date Analyzed (1): _____ Time Analyzed (1): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			

GC Column (2): _____ ID:_____(mm) Instrument ID (2): _____

EPA Sample No. (Standard 2): _____ Lab Sample ID (2): _____

Date Analyzed (2): _____ Time Analyzed (2): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			

6J

INDIVIDUAL STANDARD MIXTURE B

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column (1): _____ ID:_____(mm) Instrument ID (1): _____

EPA Sample No. (Standard 1): _____ Lab Sample ID (1): _____

Date Analyzed (1): _____ Time Analyzed (1): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			

GC Column (2): _____ ID:_____(mm) Instrument ID (2): _____

EPA Sample No. (Standard 2): _____ Lab Sample ID (2): _____

Date Analyzed (2): _____ Time Analyzed (2): _____

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date:_____ Time:_____

Lab File ID: _____ Init. Calib. Date(s):_____ _____

Heated Purge: (Y/N) ___ Init. Calib. Times: _____ _____

GC Column: _____ ID: _____(mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Chloromethane					
Bromomethane			0.100		25.0
Vinyl Chloride			0.100		25.0
Chloroethane					
Methylene Chloride					
Acetone					
Carbon Disulfide					
1,1-Dichloroethene			0.100		25.0
1,1-Dichloroethane			0.200		25.0
1,2-Dichloroethene (total)					
Chloroform			0.200		25.0
1,2-Dichloroethane			0.100		25.0
2-Butanone					
1,1,1-Trichloroethane			0.100		25.0
Carbon Tetrachloride			0.100		25.0
Bromodichloromethane			0.200		25.0
1,2-Dichloropropane					
cis-1,3-Dichloropropene			0.200		25.0
Trichloroethene			0.300		25.0
Dibromochloromethane			0.100		25.0
1,1,2-Trichloroethane			0.100		25.0
Benzene			0.500		25.0
trans-1,3-Dichloropropene			0.100		25.0
Bromoform			0.100		25.0
4-Methyl-2-Pentanone					
2-Hexanone					
Tetrachloroethene			0.200		25.0
1,1,2,2-Tetrachloroethane			0.300		25.0
Toluene			0.400		25.0
Chlorobenzene			0.500		25.0
Ethylbenzene			0.100		25.0
Styrene			0.300		25.0
Xylene (total)			0.300		25.0
Toluene-d8					
Bromofluorobenzene			0.200		25.0
1,2-Dichloroethane-d4					

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date:_____ Time:_____

Lab File ID: _____ Init. Calib. Date(s):_____ _____

Init. Calib. Times: _____ _____

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Phenol			0.800		25.0
bis(2-Chloroethyl)ether			0.700		25.0
2-Chlorophenol			0.800		25.0
1,3-Dichlorobenzene			0.600		25.0
1,4-Dichlorobenzene			0.500		25.0
1,2-Dichlorobenzene			0.400		25.0
2-Methylphenol			0.700		25.0
2,2'-oxybis(1-Chloropropane)					
4-Methylphenol			0.600		25.0
N-Nitroso-di-n-propylamine			0.500		25.0
Hexachloroethane			0.300		25.0
Nitrobenzene			0.200		25.0
Isophorone			0.400		25.0
2-Nitrophenol			0.100		25.0
2,4-Dimethylphenol			0.200		25.0
bis(2-Chloroethoxy)methane			0.300		25.0
2,4-Dichlorophenol			0.200		25.0
1,2,4-Trichlorobenzene			0.200		25.0
Naphthalene			0.700		25.0
4-Chloroaniline					
Hexachlorobutadiene					
4-Chloro-3-methylphenol			0.200		25.0
2-Methylnaphthalene			0.400		25.0
Hexachlorocyclopentadiene					
2,4,6-Trichlorophenol			0.200		25.0
2,4,5-Trichlorophenol			0.200		25.0
2-Chloronaphthalene			0.800		25.0
2-Nitroaniline					
Dimethylphthalate					
Acenaphthylene			0.900		25.0
2,6-Dinitrotoluene			0.200		25.0
3-Nitroaniline					
Acenaphthene			0.900		25.0
2,4-Dinitrophenol					
4-Nitrophenol					
Dibenzofuran			0.800		25.0
2,4-Dinitrotoluene			0.200		25.0

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date:_____ Time:_____

Lab File ID: _____ Init. Calib. Date(s):_____ _____

Init. Calib. Times: _____ _____

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate					
4-Chlorophenyl-phenylether			0.400		25.0
Fluorene			0.900		25.0
4-Nitroaniline					
4,6-Dinitro-2-methylphenol					
N-Nitrosodiphenylamine (1)					
4-Bromophenyl-phenylether			0.100		25.0
Hexachlorobenzene			0.100		25.0
Pentachlorophenol			0.050		25.0
Phenanthrene			0.700		25.0
Anthracene			0.700		25.0
Carbazole					
Di-n-butylphthalate					
Fluoranthene			0.600		25.0
Pyrene			0.600		25.0
Butylbenzylphthalate					
3,3'-Dichlorobenzidine					
Benzo(a)anthracene			0.800		25.0
Chrysene			0.700		25.0
bis(2-Ethylhexyl)phthalate					
Di-n-octylphthalate					
Benzo(b)fluoranthene			0.700		25.0
Benzo(k)fluoranthene			0.700		25.0
Benzo(a)pyrene			0.700		25.0
Indeno(1,2,3-cd)pyrene			0.500		25.0
Dibenz(a,h)anthracene			0.400		25.0
Benzo(g,h,i)perylene			0.500		25.0
Nitrobenzene-d5			0.200		25.0
2-Fluorobiphenyl			0.700		25.0
Terphenyl-d14			0.500		25.0
Phenol-d5			0.800		25.0
2-Fluorophenol			0.600		25.0
2,4,6-Tribromophenol					
2-Chlorophenol-d4			0.800		25.0
1,2-Dichlorobenzene-d4			0.400		25.0

(1) Cannot be separated from Diphenylamine

All other compounds must meet a minimum RRF of 0.010.

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column: _____ ID: _____(mm) Init. Calib. Date(s):_____ _____

EPA Sample No.(PIBLK): _____ Date Analyzed :_____

Lab Sample ID (PIBLK):_____ Time Analyzed :_____

EPA Sample No.(PEM): _____ Date Analyzed :_____

Lab Sample ID (PEM):_____ Time Analyzed :_____

PEM COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
alpha-BHC						
beta-BHC						
gamma-BHC (Lindane)						
Endrin						
4,4'-DDT						
Methoxychlor						

4,4'-DDT % breakdown (1): _____ Endrin % breakdown (1): _____

Combined % breakdown (1): _____

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column: _____ ID: _____(mm) Init. Calib. Date(s):_____ _____

EPA Sample No.(PIBLK): _____ Date Analyzed :_____

Lab Sample ID (PIBLK): _____ Time Analyzed :_____

EPA Sample No.(INDA): _____ Date Analyzed :_____

Lab Sample ID (INDA): _____ Time Analyzed :_____

INDIVIDUAL MIX A COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
alpha-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Endosulfan I						
Dieldrin						
Endrin						
4,4'-DDD						
4,4'-DDT						
Methoxychlor						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

EPA Sample No.(INDB): _____ Date Analyzed :_____

Lab Sample ID (INDB): _____ Time Analyzed :_____

INDIVIDUAL MIX B COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
beta-BHC						
delta-BHC						
Aldrin						
Heptachlor epoxide						
4,4'-DDE						
Endosulfan II						
Endosulfan sulfate						
Endrin ketone						
Endrin aldehyde						
alpha-Chlordane						
gamma-Chlordane						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): _____ Date Analyzed:_____

Instrument ID:_____ Time Analyzed:_____

GC Column: _____ ID: _____(mm) Heated Purge: (Y/N) ___

	EPA SAMPLE NO.	IS1(BCM) AREA	#	RT	#	IS2(DFB) AREA	#	RT	#	IS3(CBZ) AREA	#	RT	#
	12 HOUR STD												
	UPPER LIMIT												
	LOWER LIMIT												
01													
02													
03													
04													
05													
06													
07													
08													
09													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): _____ Date Analyzed:_____

Instrument ID: _____ Time Analyzed:_____

		IS1(DCB) AREA #	RT #	IS2(NPT) AREA #	RT #	IS3(ANT) AREA #	RT #
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

page __ of __

8C

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): _____ Date Analyzed:_____

Instrument ID: _____ Time Analyzed:_____

		IS4(PHN) AREA	#	RT	#	IS5(CRY) AREA	#	RT	#	IS6(PRY) AREA	#	RT	#
	12 HOUR STD												
	UPPER LIMIT												
	LOWER LIMIT												
	EPA SAMPLE NO.												
01													
02													
03													
04													
05													
06													
07													
08													
09													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

page __ of __

8D

PESTICIDE ANALYTICAL SEQUENCE

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GC Column: _____ ID: _____(mm) Init. Calib. Date(s):_____ _____

Instrument ID: _____

THE ANALYTICAL SEQUENCE OF PERFORMANCE EVALUATION MIXTURES, BLANKS, SAMPLES, AND STANDARDS IS GIVEN BELOW:

MEAN SURROGATE RT FROM INITIAL CALIBRATION
TCX: _____ DCB: _____

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	TCX RT #	DCB RT #
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						

QC LIMITS

TCX = Tetrachloro-m-xylene (± 0.05 MINUTES)
DCB = Decachlorobiphenyl (± 0.10 MINUTES)

Column used to flag retention time values with an asterisk.
* Values outside of QC limits.

9A

PESTICIDE FLORISIL CARTRIDGE CHECK

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Florisil Cartridge Lot Number: _____ Date of Analysis: _____

GC Column(1): _____ ID: _____(mm) GC Column(2): _____ ID: _____(mm)

COMPOUND	SPIKE ADDED (ng)	SPIKE RECOVERED (ng)	% REC #	QC LIMITS
alpha-BHC				80-120
gamma-BHC (Lindane)				80-120
Heptachlor				80-120
Endosulfan I				80-120
Dieldrin				80-120
Endrin				80-120
4,4'-DDD				80-120
4,4'-DDT				80-120
Methoxychlor				80-120
Tetrachloro-m-xylene				80-120
Decachlorobiphenyl				80-120

Column to be used to flag recovery with an asterisk.
* Values outside of QC limits.

THIS CARTRIDGE LOT APPLIES TO THE FOLLOWING SAMPLES, BLANKS, MS, AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				

PESTICIDE GPC CALIBRATION

Lab Name:_____ Contract:_____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

GPC Column: _____ Calibration Date: _____

GC Column(1): _____ ID: _____(mm) GC Column(2): _____ ID: _____(mm)

COMPOUND	SPIKE ADDED (ng)	SPIKE RECOVERED (ng)	% REC #	QC. LIMITS REC.
gamma-BHC (Lindane)				80-110
Heptachlor				80-110
Aldrin				80-110
Dieldrin				80-110
Endrin				80-110
4,4'-DDT				80-110

Column to be used to flag recovery values with an asterisk
* Values outside of QC limits

THIS GPC CALIBRATION APPLIES TO THE FOLLOWING SAMPLES, BLANKS, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

10A

EPA SAMPLE NO.

PESTICIDE IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab Sample ID : _____ Date(s) Analyzed: _____ _____

Instrument ID (1): _____ Instrument ID (2): _____

GC Column(1): _____ ID: _____(mm) GC Column(2): _____ ID: _____(mm)

ANALYTE	COL	RT	RT WINDOW FROM	RT WINDOW TO	CONCENTRATION	%D
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					

page __ of __

10B

EPA SAMPLE NO.

PESTICIDE IDENTIFICATION SUMMARY
FOR MULTICOMPONENT ANALYTES

Lab Name: ____________ Contract: ____________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab Sample ID : ____________ Date(s) Analyzed: ______ ______

Instrument ID (1): ____________ Instrument ID (2): ____________

GC Column(1): ________ ID: _____(mm) GC Column(2): ________ ID: _____(mm)

ANALYTE	PEAK	RT	RT WINDOW FROM	RT WINDOW TO	CONCENTRATION	MEAN CONCENTRATION	%D
____________	1						
	2						
	3						
COLUMN 1	4						
	5						
	1						
	2						
	3						
COLUMN 2	4						
	5						
____________	1						
	2						
	3						
COLUMN 1	4						
	5						
	1						
	2						
	3						
COLUMN 2	4						
	5						
____________	1						
	2						
	3						
COLUMN 1	4						
	5						
	1						
	2						
	3						
COLUMN 2	4						
	5						

At least 3 peaks for each column are required for identification of multicomponent analytes

page __ of __

SAMPLE LOG-IN SHEET

Lab Name			Page _____ of _____
Received By (Print Name)			Log-in Date
Received By (Signature)			
Case Number	Sample Delivery Group No.		SAS Number

Remarks:		EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent* Intact/Broken				
2. Custody Seal Nos.	_____ _____				
3. Chain-of Custody Records	Present/Absent*				
4. Traffic Reports or Packing Lists	Present/Absent*				
5. Airbill	Airbill/Sticker Present/Absent*				
6. Airbill No.	_____ _____				
7. Sample Tags	Present/Absent*				
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody				
8. Sample Condition	Intact/Broken*/Leaking				
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*				
10. Date Received at Lab	_____				
11. Time Received	_____				
Sample Transfer					
Fraction	Fraction				
Area #	Area #				
By	By				
On	On				

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET

LABORATORY NAME _____
CITY/STATE _____

CASE NO. _____ SDG NO. _____ SDG NOS. TO FOLLOW _____
_____ _____ SAS NO. _____

CONTRACT NO. _____
SOW NO. _____

All documents delivered in the Complete SDG File must be original documents where possible.

	PAGE NOs FROM	TO	CHECK LAB	EPA
1. Inventory Sheet (Form DC-2) (Do not number)	____	____	_____	_____
2. SDG Case Narrative	____	____	_____	_____
3. SDG Cover Sheet/Traffic Report	____	____	_____	_____
4. Volatiles Data				
a. QC Summary				
System Monitoring Compound Summary (Form II VOA)	____	____	_____	_____
Matrix Spike/Matrix Spike Duplicate Summary (Form III VOA)	____	____	_____	_____
Method Blank Summary (Form IV VOA)	____	____	_____	_____
GC/MS Instrument Performance Check (Form V VOA)	____	____	_____	_____
Internal Standard Area and RT Summary (Form VIII VOA)	____	____	_____	_____
b. Sample Data	____	____	_____	_____
TCL Results - (Form I VOA)			_____	_____
Tentatively Identified Compounds (Form I VOA-TIC)			_____	_____
Reconstructed total ion chromatograms (RIC) for each sample			_____	_____
For each sample:				
Raw spectra and background-subtracted mass spectra of target compounds identified			_____	_____
Quantitation reports			_____	_____
Mass spectra of all reported TICs with three best library matches			_____	_____
c. Standards Data (All Instruments)	____	____		
Initial Calibration Data (Form VI VOA)			_____	_____
RICs and Quan Reports for all Standards			_____	_____
Continuing Calibration Data (Form VII VOA)			_____	_____
RICs and Quantitation Reports for all Standards			_____	_____
d. Raw QC Data				
BFB	____	____	_____	_____
Blank Data	____	____	_____	_____
Matrix Spike/Matrix Spike Duplicate Data	____	____	_____	_____

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. _____ SDG NO. _____ SDG NOS. TO FOLLOW _____
_____ _____ SAS NO. _____

	PAGE NOs FROM	TO	CHECK LAB	EPA
5. **Semivolatiles Data**				
a. QC Summary				
Surrogate Percent Recovery Summary (Form II SV)	____	____	_____	_____
MS/MSD Summary (Form III SV)	____	____	_____	_____
Method Blank Summary (Form IV SV)	____	____	_____	_____
GC/MS Instrument Performance Check (Form V SV)	____	____	_____	_____
Internal Standard Area and RT Summary (Form VIII SV)	____	____	_____	_____
b. Sample Data	____	____		
TCL Results (Form I SV-1, SV-2)				
Tentatively Identified Compounds (Form I SV-TIC)			_____	_____
Reconstructed total ion chromatograms (RIC) for each sample			_____	_____
For each sample:				
Raw spectra and background-subtracted mass spectra of target compounds			_____	_____
Quantitation reports			_____	_____
Mass spectra of TICs with three best library matches			_____	_____
GPC chromatograms (if GPC performed)			_____	_____
c. Standards Data (All Instruments)	____	____		
Initial Calibration Data (Form VI SV-1, SV-2)			_____	_____
RICs and Quan Reports for all Standards			_____	_____
Continuing Calibration Data (Form VII SV-1, SV-2)			_____	_____
RICs and Quantitation Reports for all Standards			_____	_____
Semivolatile GPC Calibration Data-UV detector traces			_____	_____
d. Raw QC Data				
DFTPP	____	____	_____	_____
Blank Data	____	____	_____	_____
Matrix Spike/Matrix Spike Duplicate Data	____	____	_____	_____
e. Raw GPC Data	____	____	_____	_____
6. **Pesticides**				
a. QC Summary				
Surrogate Percent Recovery Summary (Form II PEST)	____	____	_____	_____
MS/MSD Duplicate Summary (Form III PEST)	____	____	_____	_____
Method Blank Summary (Form IV PEST)	____	____	_____	_____

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. _____	SDG NO. _____	SDG NOS. TO FOLLOW _____
_____ _____	SAS NO. _____	

	PAGE NOs FROM	PAGE NOs TO	CHECK LAB	CHECK EPA
6. Pesticides (Cont.)				
b. Sample Data	____	____		
TCL Results - Organic Analysis Data Sheet (Form I PEST)			____	_____
Chromatograms (Primary Column)			____	_____
Chromatograms from second GC column confirmation			____	_____
GC Integration report or data system printout			____	_____
Manual work sheets			____	_____
For pesticides/Aroclors confirmed by GC/MS, copies of raw spectra and copies of background-subtracted mass spectra of target compounds (samples & standards)			____	_____
c. Standards Data	____	____		
Initial Calibration of Single Component Analytes (Form VI PEST-1 and PEST-2)			____	_____
Initial Calibration of Multicomponent Analytes (Form VI PEST-3)			____	_____
Analyte Resolution Summary (Form VI PEST-4)			____	_____
Performance Evaluation Mixture (Form VI PEST-5)			____	_____
Individual Standard Mixture A (Form VI PEST-6)			____	_____
Individual Standard Mixture B (Form VI PEST-7)			____	_____
Calibration Verification Summary (Form VII PEST-1)			____	_____
Calibration Verification Summary (Form VII PEST-2)			____	_____
Analytical Sequence (Form VIII PEST)			____	_____
Florisil Cartridge Check (Form IX PEST-1)			____	_____
Pesticide GPC Calibration (Form IX PEST-2)			____	_____
Pesticide Identification Summary for Single Component Analytes (Form X PEST-1)			____	_____
Pesticide Identification Summary for Multicomponent Analytes (Form X PEST-2)			____	_____
Chromatograms and data system printouts A printout of retention times and corresponding peak areas or peak heights			____	_____
Pesticide GPC calibration data - UV detector traces			____	_____
d. Raw QC Data				
Blank Data	____	____	____	_____
Matrix Spike/Matrix Spike Duplicate Data	____	____	____	_____

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. _____ SDG NO. _____ SDG NOS. TO FOLLOW _____
_____ _____ SAS NO. _____

	PAGE NOs FROM	TO	CHECK LAB	EPA
6. Pesticides (Cont.)				
e. Raw GPC Data	____	____	_____	_____
f. Raw Florisil Data	____	____	_____	_____
7. Miscellaneous Data				
Original preparation and analysis forms or copies of preparation and analysis logbook pages	____	____	_____	_____
Internal sample and sample extract transfer chain-of-custody records	____	____	_____	_____
Screening records	____	____	_____	_____
All instrument output, including strip charts from screening activities (describe or list)				
_____	____	____	_____	_____
_____	____	____	_____	_____
8. EPA Shipping/Receiving Documents				
Airbills (No. of shipments ___)	____	____	_____	_____
Chain-of-Custody Records	____	____	_____	_____
Sample Tags	____	____	_____	_____
Sample Log-In Sheet (Lab & DCl)	____	____	_____	_____
Miscellaneous Shipping/Receiving Records (describe or list)				
_____	____	____	_____	_____
_____	____	____	_____	_____
9. Internal Lab Sample Transfer Records and Tracking Sheets (describe or list)				
_____	____	____	_____	_____
_____	____	____	_____	_____
10. Other Records (describe or list)				
Telephone Communication Log	____	____	_____	_____
_____	____	____	_____	_____
_____	____	____	_____	_____

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. _____ SDG NO. _____ SDG NOS. TO FOLLOW _____
_____ _____ SAS NO. _____

11. **Comments:** _____

_____

_____

Completed by: _____	_____	_____	_____
(CLP Lab)	(Signature)	(Printed Name/Title)	(Date)
Verified by: _____	_____	_____	_____
(CLP Lab)	(Signature)	(Printed Name/Title)	(Date)
Audited by: _____	_____	_____	_____
(EPA)	(Signature)	(Printed Name/Title)	(Date)

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COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

SOW No.: _____

EPA Sample No.	Lab Sample ID.

Were ICP interelement corrections applied? Yes/No ___

Were ICP background corrections applied? Yes/No ___

If yes-were raw data generated before application of background corrections? Yes/No ___

Comments:

_____

_____

_____

_____

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: _____ Name: _____

Date: _____ Title: _____

1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: _____

Level (low/med): _____ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

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2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Initial Calibration Source: _____

Continuing Calibration Source: _____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

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2B
CRDL STANDARD FOR AA AND ICP

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

AA CRDL Standard Source: _____

ICP CRDL Standard Source: _____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

Control Limits: no limits have been established by EPA at this time

3
BLANKS

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium											
Manganese											
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

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4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ ICS Source: _____

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antinony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

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5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

% Solids for Sample: _____

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

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5B

POST DIGEST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

_____

_____

_____

_____

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6
DUPLICATES

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

% Solids for Sample: _____ % Solids for Duplicate: _____

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

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7

LABORATORY CONTROL SAMPLE

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Solid LCS Source: _____

Aqueous LCS Source: _____

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

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STANDARD ADDITION RESULTS

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Concentration Units: ug/L

EPA Sample No.	An	0 ADD ABS	1 ADD CON	1 ADD ABS	2 ADD CON	2 ADD ABS	3 ADD CON	3 ADD ABS	Final Conc.	r	Q

9

ICP SERIAL DILUTIONS

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Flame AA ID Number: _____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			3		
Magnesium			5000		
Manganese			15		
Mercury			0.2		
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		
Cyanide			10		

Comments:

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11A

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Analyte	Wavelength (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	___
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

_____

_____

_____

_____

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11B
ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Analyte	Wavelength (nm)	Interelement Correction Factors for: ___	___	___	___	___
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

_____

_____

_____

_____

12

ICP LINEAR RANGES (QUARTERLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum			
Antimony			
Arsenic			
Barium			
Beryllium			
Cadmium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Magnesium			
Manganese			
Mercury			
Nickel			
Potassium			
Selenium			
Silver			
Sodium			
Thallium			
Vanadium			
Zinc			

Comments:

_____

_____

_____

_____

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13
PREPARATION LOG

Lab Name: ______________________________ Contract: ____________

Lab Code: _________ Case No.: ______ SAS No.: _______ SDG No.: _______

Method: ____

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)

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ANALYSIS RUN LOG

Lab Name: ______________________ Contract: ________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID Number: ____________ Method: __

Start Date: ________ End Date: ________

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN

ATTACHMENT B

FIELD DATA SHEETS

PROJECT NO. | HULL & ASSOCIATES, INC. | SHEET OF

DAILY FIELD REPORT

PROJECT _____ DATE _____

LOCATION _____ WEATHER _____

CONTRACTOR _____ TIME ON-SITE FROM _____

TO _____

VISITORS ON SITE _____

DESCRIPTION OF WORK _____

EQUIPMENT USED	HOURS
LABOR	

WORK INSPECTED BY _____

REPORT PREPARED BY _____

Hull & Associates, Inc.
6130 Wilcox Road
Dublin, Ohio 43016

FIELD DATA SHEET
GROUND-WATER MONITORING
WELL SAMPLING

Well I.D._____

Client:_____ Site Location:_____

Site No.:_____ Project No.:_____

Air Temperature:_____ Weather Conditions:_____

Type of Well Construction_____

Condition of Well circle (Good / Poor) if poor, specify _____

Cap Locked (Yes / No)_____ Lock No.:_____

Depth to Water_____feet Total Depth_____feet

Free Product circle (Yes / No) Depth to Product_____feet

Product Thickness_____feet

Sample Date_____ Sample No.:_____

PURGE DATA		FIELD TESTING / WELL VOLUME		
VOLUME PURGED (GALLONS)/WELL VOLUME	NO. OF WELL VOLUMES	TEMP. °C	pH AT 25°C	CONDUCTIVITY units_____ AT 25°C
NA	STATIC			
	1			
	2			
	3			
	4			
	5			

1 Well Volume Equals:_____ Gallons

Comments:_____

Drum Inventory: Soil_____ Purge Water_____ Free Product_____

HULL & ASSOCIATES, INC. WELL DEVELOPMENT FORM

Job Number:	Well No and Type:	Static Water Depth (ft TOC[a]):	at	hrs.
Site:	Initial Total Depth (ft TOC):	Depth to NAPL[b]	at	hrs.
Developers:	Final Total Depth (ft TOC):	Weather:		

Date	Time	Purge Method	Pumping Rate	Volume Purged[d]	DTW[e]	pH[f]	Temp.[g]	Spec. Cond.[h]	Turbidity[i]	Comments

IMHOFF CONE TEST

Start Time: _____ Volume Water: _____ End Time: _____ Volume Sediment: _____

a. Top of casing.
b. NAPL - nonaqueous phase liquid.
c. Gallons per minute.
d. Cumulative gallons.
e. Depth to water.
f. Standard units.
g. °C, unless °F noted.
h. Specific conductance, µmhos/cm (or µS/cm).
i. Visual unless otherwise noted.

Water Level and Interface Measurement Sheet

HAI Project # _____ Site Location _____

HAI Site Personnel _____ Date _____

Well Name	Static Water Level	Depth to Bottom	Volume	Depth to Product	Product Thickness	Comments

BPFORMD.005

HULL & ASSOCIATES, INC. SOIL BORING FIELD LOG

LOCATION OF BORING:	PROJ No:	CLIENT:	LOCATION:
	PROJECT:		BORING No:
	DRILLING METHOD:		
	SAMPLING METHOD:		SHEET
	PID/FID CALIBRATION,BACKGROUND:		OF
	WEATHER:		DRILLING
CONTRACTOR:	WATER LEVEL FROM:		START / FINISH
LOGGED BY: DATE:	TIME:		TIME: / TIME:
CHECKED BY: DATE:	DATE:		DATE: / DATE:
DATUM: ELEVATION:	DEPTH:		NOTES (SURFACE CONDITION, LAB SOIL SAMPLE NUMBERS, SOIL DRUMS, ETC.):

SAMPLER TYPE	DRV./REC.	SMPL.No./DEPTH	BLOW COUNTS	PID/FID (ppm)	DEPTH IN FEET	SAMPLE	SOIL GRAPH	WELL

f:\data\bpf\bpformd.024

CHAIN OF CUSTODY RECORD

Hull & Associates, Inc.

PAGE ____ OF ____

NO. 1122

☐ Dublin
6130 Wilcox Road
Dublin, Ohio 43017
Phone: (614)793-8777
FAX: (614)793-9070

☐ Toledo
2725 Monroe Street
Toledo, Ohio 43606
Phone: (419)241-7171
FAX: (419)241-3117

☐ Mason
4700 Duke Drive, Suite 172
Mason, Ohio 45040
Phone: (513)459-9677
FAX: (513)459-9869

☐ Warrensville Heights
4949 Galaxy Parkway, Suite S
Warrensville Heights, Ohio 44128
Phone: (216)514-7100
FAX: (216)514-7104

REPORT TO: ____________________

Client: ____________________

Site: ____________________

Project#: __________ Phase: __________

Samplers: ____________________

SAMPLE MATRIX
1. WATER
2. SOIL
3. SLUDGE
4. OIL
5. TISSUE
6. SEDIMENT
OTHER: ______

PRESERVATIVES
A – Cool only, <4° C
B – HNO_3 pH<2
C – H_2SO_4 pH<2
D – NaOH pH>12
E – ZnAcetate + NaOH, pH>9
F – $Na_2S_2O_3$(0.008%)
G – HCl pH <2

METALS
F – FILTERED
N – NOT FILTERED
B – BOTH

All samples are kept at 4°C.

PRESERVATIVES

ANALYSES

SAMPLE IDENTIFICATION	SAMPLE MATRIX	NO. OF CONT.	METALS	SAMPLING DATE/TIME												COMMENTS
				/												
				/												
				/												
				/												
				/												
				/												
				/												
				/												
				/												
				/												
				/												
				/												

RELINQUISHED BY:	DATE: – – TIME: – –	RECEIVED BY:	DATE: – – TIME: – –
RELINQUISHED BY:	DATE: – – TIME: – –	RECEIVED BY:	DATE: – – TIME: – –
RELINQUISHED BY:	DATE: – – TIME: – –	RECEIVED FOR LAB BY:	DATE: – – TIME: – –
COOLER TEMPERATURE AS RECEIVED °C :	°C	DISTRIBUTION: WHITE —LAB USE (MUST BE RETURNED WITH REPORT) YELLOW —LAB USE PINK —RETAINED BY HAI	

Deliver To: ____________________

Method of Delivery: ____________________

Airbill Number: ____________________

NOTES: ____________________

HAI/0898T263
08/14/97 CORNER